NAVSHIPS 93147 *(Non-Registered)*

TECHNICAL MANUAL

for

RADIO INTERFERENCE MEASURING SET AN/URM-47A

STODDART AIRCRAFT RADIO COMPANY, INC.

HOLLYWOOD 38, CALIFORNIA

DEPARTMENT of the NAVY

BUREAU OF SHIPS

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From: Chief, Bureau of Ships
To: All Activities concerned with the Installation, Operation, and Maintenance of the Subject Equipment

Subj: Technical Manual for Radio Interference Measuring Set, AN/URM-47A, NAVSHIPS 93147

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A. G. MUMMA
Chief of Bureau

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SECTION 1

GENERAL DESCRIPTION

1-1. SCOPE OF INSTRUCTION BOOK.

This instruction book contains descriptive material, theory of operation, and instructions for the installation, operation, and maintenance of Radio Interference Measuring Set AN/URM-47A, which is manufactured under contract NObsr-71848, dated 28 June 1957.

1-2. PURPOSE AND BASIC PRINCIPLES.

(See figure 1—1.)

Radio Interference Measuring Set AN/URM-47A is a highly sensitive h-f and v-h-f superheterodyne receiver for use in the location and measurement of r-f interference (noise) and for making field-intensity measurements in the frequency range of 20 to 400 mc. It is basically a selective two-terminal voltmeter with sufficient sensitivity to measure r-f interference or the intensity of radiated or conducted r-f signals.

Note

Radio Interference-Field Intensity Meter IM-88/URM-47 is the control and metering unit of Radio Interference Measuring Set AN/URM-47A. For simplicity, the former will hereafter be referred to as the RI-FI Meter.

Radio Interference Measuring Set AN/URM-47A consists of the meter unit (RI-FI Meter), a power supply (Power Supply PP-906A/URM-47), and several antennas for interference or signal pickup, and other accessory components necessary for proper interconnection and operation of the equipment. The equipment is suitable for operation aboard naval vessels, at shore stations, in the field, in aircraft, and in military vehicles.

Quantitative measurements of the intensity of radio signals or interference can be made by use of the dipole antennas provided in conjunction with the RI-FI Meter. Measurements can be made in terms of the *peak, weighted,* or *average* value of the signal or interference. This facility is provided by a calibrated meter and a function switch on the meter unit. The function switch provides for the measurement of the peak value in its PEAK position, the weighted value in its QUASI PEAK position, and the average value in its FIELD INTENSITY position. In addition, the RI-FI Meter contains facilities for calibrating or standardizing its gain; this is accomplished in the CAL position of the function switch. To facilitate more accurate tuning of a weak signal, a beat frequency oscillator is incorporated in the i-f channel; by this means, the weak signal can be tuned by observing the zero beat note (audio null); then the strength of the signal can be measured accurately in either the FIELD INTENSITY or QUASI PEAK positions of the function switch.

Frequency-modulated signals can be received with reasonable audio quality through the use of "slope detection". This not ony simplifies the circuitry of the receiver and minimizes maintenance parts, but also provides fair frequency-modulation quality without the use of complicated circuits and additional adjustments.

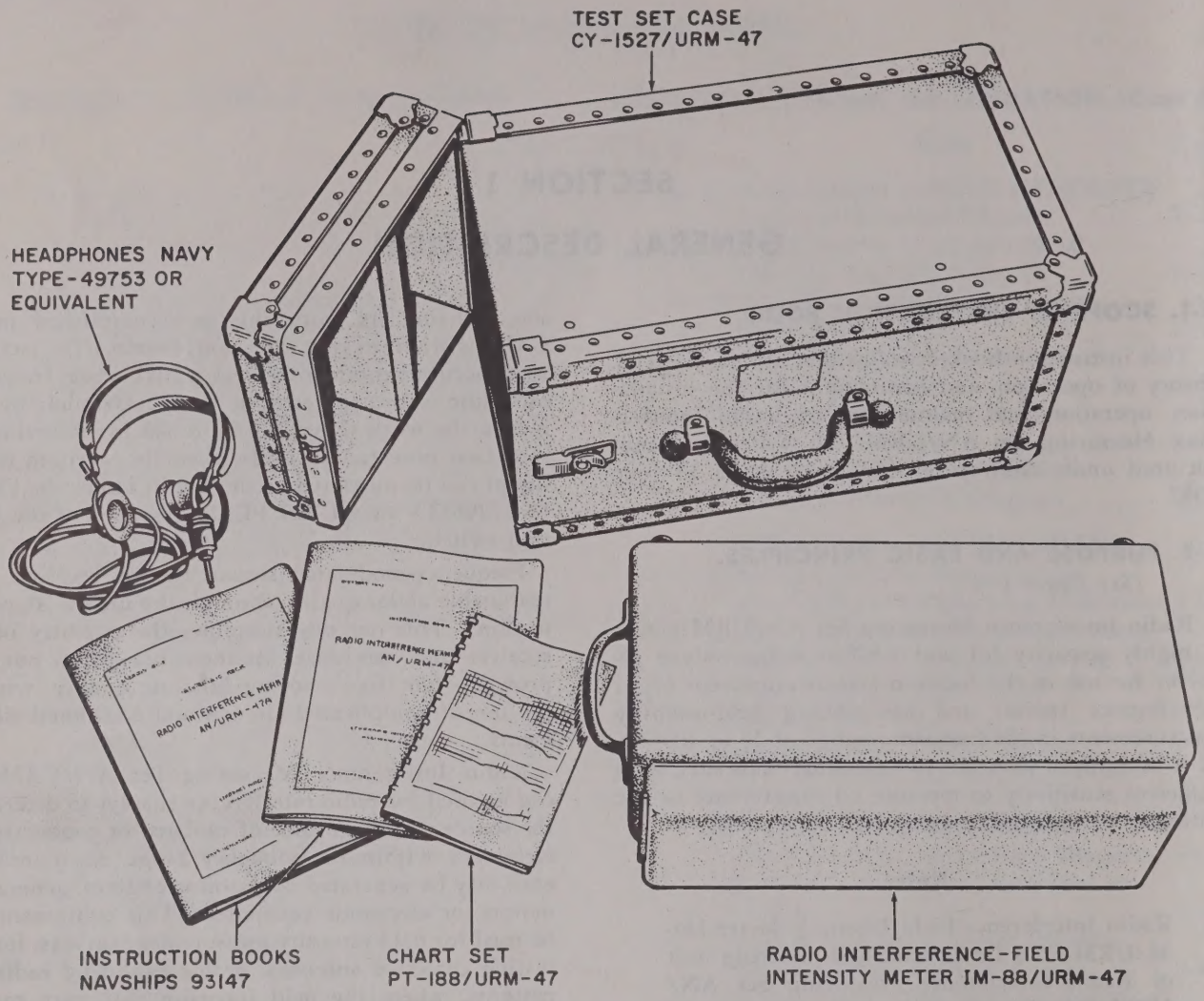
Radio Interference Measuring Set AN/URM-47A can be used for radio interference surveys to determine the source and magnitude of radiated or conducted interference within its frequency range. Such interference may be generated by gasoline engines, generators, motors, or electronic equipment. This equipment can be used for field intensity measurement surveys, for adjusting directive antennas, or for exploring radiation patterns, where the field intensity may vary over a wide range of values.

Proper use of the pickup devices will enable the operator of the equipment to locate the source of the signal or interference by successive measurements. In the case of interference, this is the first step in the elimination procedures.

1-3. DESCRIPTION OF MAJOR UNITS.

a. CARRYING CASES.—Radio Interference Measuring Set AN/URM-47A is contained in three carrying cases for convenience in transporting the equipment. These cases, Test Set Case CY-1527/URM-47, Accessories Case CY-1525/URM-47, and Antenna Case CY-1526/URM-47 are similarly constructed of plywood with black fiber covering. Corners are protected with nickel plated brass plates. Each case has a flock-lined interior and is equipped with a carrying handle. The case interiors are fitted with racks, blocks, pads, or straps to hold the various units and accessories in position.

The succeeding subparagraphs describe the contents of the carrying cases and indicate the significant features of each.



☐ HEADPHONES
NAVY TYPE-49753 OR EQUIVALENT

☐ INSTRUCTION BOOK
NAVSHIPS 93147

☐ INSTRUCTION BOOK
NAVSHIPS 93147

☐ CHART SET PT-188/URM-47

☐ RADIO INTERFERENCE-FIELD
INTENSITY METER IM-88/URM-47

Figure 1-2. Test Set Case CY-1527/URM-47, Contents Displayed

Note

The interior of each carrying case contains a plate displaying the equipment which should be packed in the individual carrying case. To prevent loss of equipment, personnel responsible for repacking the equipment should place a check mark in the box following the name of each item as it is packed in the case. (See figures 1–2, 1–4, and 1–6.)

b. TEST SET CASE CY-1527/URM-47. *(See figure 1–2.)*—Test Set Case CY-1527/URM-47 contains the RI-FI Meter, two instruction books, a pair of Headphones Navy Type –49753 or equivalent, and two Chart Sets PT-188/URM-47.

(1) The RI-FI Meter is the control and metering unit of Radio Interference Measuring Set AN/URM-47A. The gray, smooth-finish case of the unit is equipped with a carrying handle and a panel-protective

cover held in place by spring clips. Tripod mounting of the RI-FI Meter is provided by means of a round plate on the bottom of the meter case. Water seals under the front panel and at the panel openings make the case substantially drip-proof. See figure 1—3 for a view of the RI-FI Meter with its protective front panel cover removed.

(2) The two instruction books are located in a side compartment of the Test Set Case CY-1527/URM-47. The instruction books should be removed first and their contents read before attempting to set up the equipment for operation.

(3) The Headphones Navy Type —49753 or equivalent are located in the case cover. The headphones are to be plugged into the PHONES receptacle on the RI-FI Meter front panel for audio indications.

(4) One Chart Set PT-188/URM-47 is held in place in the panel-protective cover of the RI-FI Meter by means of an elastic band. The other chart set is located within the RI-FI Meter case and is also held secure by an elastic band. The charts contain information for calibration settings, correction factors, antenna adjustments, and bandwidth data.

c. ACCESSORIES CASE CY-1525/URM-47. *(See figure 1—4.)*—The Accessories Case CY-1525/URM-47 contains Power Supply PP-906A/URM-47, interconnecting cables, Ammeter ME-76/U, and Antenna Base AB-364/U.

(1) Power Supply PP-906A/URM-47 supplies the plate, bias, and filament power for operating the RI-FI Meter. The construction is similar to that of the RI-FI Meter including the drip-proof features of the case. See figure 1—5 for view of the power supply with the protective front panel cover removed.

(2) Seven cables are packed in the accessories case and are located in the case cover. The cables are secured to the case by means of guides and straps. Cable Assembly CG-92D/U (20′ 0″) is the r-f transmission line which is fitted with connectors at both ends and is used to connect the various antennas to the RI-FI Meter RF INPUT receptacle. Radio Frequency Cable Assembly CG-1064/U (1′ 6″) is the r-f probe fitted with a connector at one end (for mating with the r-f transmission line) and alligator clips at the other end for connection across a load. The external a-c power source is connected to the power supply by means of the Cable Assembly CX-3810/U (6′ 6″) which is supplied with a connector at one end and a 3-pin plug at the other. The plug has two flat contacts and one U-shaped contact. An adapter is supplied with this plug to allow it to be used in two contact outlets.

Three cable assemblies, Cable Assembly CG-571/U (20′ 0″), Cable Assembly CG-572/U (20′ 0″), and Cable Assembly CG-573/U (3′ 0″) are used to connect the remote meter, Ammeter ME-76/U, the headphones, and an Oscilloscope OS-8/U or equivalent (not supplied), respectively, to the RI-FI Meter. The remote meter cable is equipped with a "microphone" type plug for connection to the REMOTE METER receptacle on the RI-FI Meter front panel and a connector for connection to Ammeter ME-76/U. The headphone extension cable is similarly designed for connection to the PHONES receptacle on the RI-FI Meter front panel and the Headphones Navy Type —49753. The oscilloscope cable is equipped with a connector at one end for connection to the OSCILLOSCOPE receptacle on the RI-FI Meter and two spade lugs at the other end for connection of an oscilloscope. Cable Assembly 91487-1 (10′ 0″) (power cable) is fitted with a male plug at one end for connection to the POWER OUTPUT receptacle on the power supply and a female plug at the other end for connection to the RI-FI Meter POWER receptable.

Figure 1-3. Radio Interference-Field Intensity Meter IM-88/URM-47 (RI-FI Meter)

(3) Ammeter ME-76/U is a remote meter similar to that mounted on the RI-FI Meter front panel and is used for giving remote indications. The meter is a d-c type, fan-shaped instrument designed to measure from 0 to 100 microvolts and 0 to 40 db. The internal meter resistance is 1500 ohms with an accuracy of ± 1 per cent.

(4) Antenna Base AB-364/U provides support for the antenna elements when used as a vertical antenna over a ground plane. The square aluminum base contains 24 screws around its periphery for attaching ground plane wires. The wires (not supplied) are to be used only when the soil is dry (poor conductivity). The base contains a cylindrical center post for mounting the antenna elements and a receptacle for connection to the r-f transmission line. A hook is also provided for the frequency-calibrated Measuring Tape TL-635/U to determine the length of the antenna elements for the desired frequency.

d. ANTENNA CASE CY-1526/URM-47. *(See figure 1—6.)*—Antenna Case CY-1526/URM-47 contains Mast AB-371/U, Antenna AT-477/U, two Mast Sections AB-363/U, Tripod CADV-10545, Antenna AT-426/U, Antenna Base AB-374/URM-47, Measuring Tape TL-635/U, Right-Angle Adapter UG-27B/U, Azimuth Dial Assembly, Azimuth Pointer Assembly, and a set of seven pairs of antenna elements. These various components are secured in the case by means of blocks, felt pads, straps, and spring-loaded guards.

(1) Mast AB-371/U is a high-frequency dipole antenna whose frequency response may be varied between 88 and 400 mc by the addition of one or two pairs of

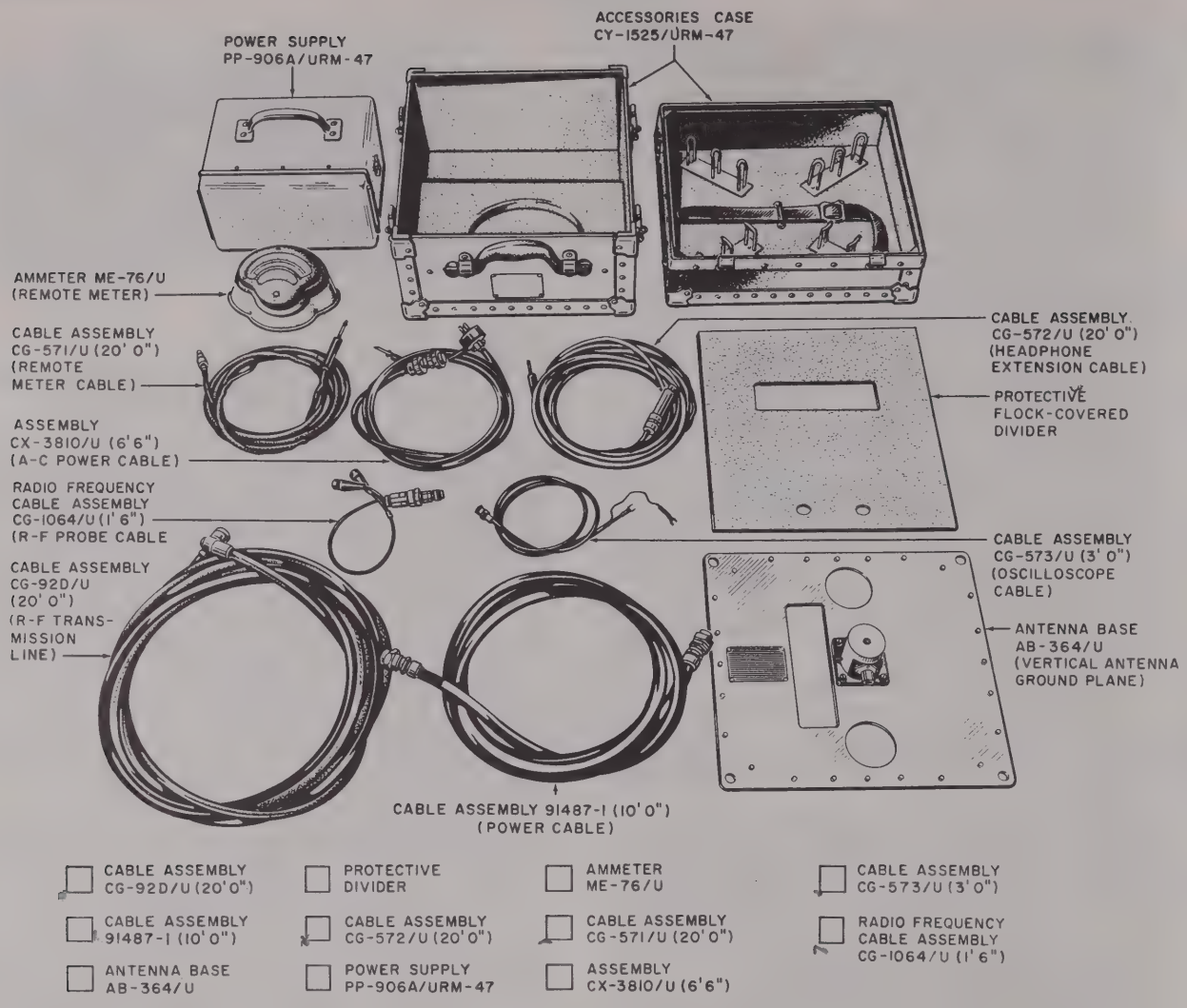


Figure 1-4. Accessories Case CY-1525/URM-47, Contents Displayed

antenna elements. The antenna contains a balun to transform the symmetrical dipole output into asymmetrical output suitable for loading with a 50-ohm coaxial transmission line. The balun is tuned at each frequency with an adjustable slider. The antenna is constructed of chrome alloy tubing. A knob is provided on the lower part of the antenna to allow tilting through a maximum of 90 degrees either side of the vertical to coincide with the polarization of the incoming signal. A hook is located at the top of the antenna for attaching the frequency-calibrated Measuring Tape TL-635/U when determining the required position of the balun slider and adjusting the length of the antenna elements for the desired frequency. Mast AB-371/U (high-frequency dipole antenna) is designed for mounting on Mast Section AB-363/U which, in turn, is mounted on Tripod CADV-10545. A connector on the high-frequency dipole permits attachment of the r-f transmission line cable.

(2) Antenna AT-477/U is a low-frequency dipole antenna whose frequency response may be varied between 20 and 88 mc by the addition of two to six pairs of antenna elements. A resistive balun is built into the antenna head which converts the balanced output voltage of the antenna to the unbalanced voltage required by the coaxial transmission line. The balun also provides a more suitable impedance match between the transmission line (50 ohms) and antenna terminals (50 ohms nominal). The antenna head also contains a variable, knob-operated inductor. This is used *only* when the antenna is used as a *fixed-length* dipole that is short with respect to a half-wave length. For measurements in confined areas, the dipole length may be adjusted for resonance at 50 megacycles. The knob-operated inductor is in series with the dipole output and is tuned to cancel the capacitive reactance of a short dipole. The low-frequency dipole antenna may also be oriented for polarization purposes. This antenna also contains a hook for attaching the measuring tape, and is designed for mounting on Mast Section AB-363/U.

(3) Mast Section AB-363/U is used for mounting the high- and low-frequency dipole antennas and may

be mounted on Tripod CADV-10545. Since two mast sections are supplied, one or both may be used as desired. They are designed so that one can fit onto the other and thus provide increased height for the antennas.

(4) Tripod CADV-10545 is an extendable tripod for mounting the dipole antennas. Its telescoping legs are fitted, at one end, with rubber feet for hard surfaces and, at the other end, with steel spikes for soft surfaces. Each leg contains two locking knobs, one for locking the leg at the desired angle and the other for locking the leg at the desired extension.

(5) Antenna AT-426/U is a shielded loop antenna used for radiation measurements. It is constructed of a single turn of solid, insulated wire which is rubber coated for added insulation properties. Since it is well insulated, it can be used for probing among "hot" wires. The loop antenna can be connected directly to the r-f transmission line cable or may be mounted into Antenna Base AB-374/URM-47, which can then be connected to the r-f transmission line.

(6) Antenna Base AB-374/URM-47 may be used as a hand-held support for the loop antenna, Antenna AT-426/U, or may be inserted into Mast Section AB-363/U for stationary measurements. The base is provided with a connector for connection to the r-f transmission line.

(7) Measuring Tape TL-635/U is a frequency-calibrated tape used for the determination of antenna length for specific frequencies. The tape can be hooked onto the two dipole antennas or the ground plan vertical antenna and the appropriate antenna elements adjusted to correspond with the desired signal frequency.

(8) Right-Angle Adapter UG-27B/U is provided for convenience only, that is, only when a right-angle bend is required or desired in the r-f transmission line. It is connected, at one end, to the r-f transmission line cable and, at the other end, to any of the dipole antennas, the loop antenna, the ground plane vertical antenna, or the r-f probe cable.

(9) The Azimuth Dial Assembly and the Azimuth Pointer Assembly are used to orient the dipole antennas using the magnetic north as a reference point. The Azimuth Pointer Assembly has a truncated conical shape and is marked with an engraved black indicating line. It is secured to Mast Section AB-363/U by means of set screws. The Azimuth Dial Assembly has an engraved circular ring indicating 360 degrees by 10-degree marks. Two sighting pins are provided for proper alignment.

(10) The seven pairs of antenna elements are to be used on the dipole and vertical antennas in the combinations specified in Chart Set PT-188/URM-47 for the desired frequencies. The seven pairs of antenna elements are color-coded for identification. Three pairs of elements have a red-colored band, one pair has a yellow-colored band, another pair has a green-colored band, another pair has a blue-colored band, and the last pair has a white-colored band. All the elements (except the white and blue pairs) have an external thread at one end and an internal thread at the other end and therefore may be screwed into each other or into the antennas. The white and blue pairs of antenna elements have external threads on one end and telescoping sections on the other end and therefore must be used at the extreme ends only.

Figure 1-5. Power Supply PP-906A/URM-47

1-4. REFERENCE DATA.

a. NOMENCLATURE.—Radio Interference Measuring Set AN/URM-47A.

b. CONTRACT NUMBER AND DATE.—NObsr-71848, dated 28 June 1957.

c. CONTRACTOR.—Stoddart Aircraft Radio Co. Inc., Hollywood 38, California.

d. COGNIZANT NAVAL INSPECTOR.—Inspector of Naval Material, Los Angeles, California.

e. NUMBER OF PACKAGES INVOLVED IN COMPLETE SHIPMENT.—One.

f. TOTAL CUBICAL CONTENTS.
(1) CRATED.—13.9 cubic feet.
(2) UNCRATED.—6.1 cubic feet.

g. TOTAL WEIGHT.
(1) CRATED.—215 pounds.
(2) UNCRATED.—135 pounds.

h. FREQUENCY RANGE.—20 to 400 megacycles covered in six bands:

Band 1—20 to 33 mc
Band 2—33 to 54 mc
Band 3—54 to 88 mc
Band 4—88 to 145 mc
Band 5—145 to 250 mc
Band 6—240 to 400 mc

i. TYPE OF RECEIVER.—Superheterodyne.

j. INTERMEDIATE FREQUENCY.—15 megacycles.

k. SENSITIVITY.—Radiated pickup using a calibrated, tuned dipole (without reflector), one to 60 microvolts-per-meter, depending on frequency used. Conducted pickup via a 50-ohm matched coaxial line,

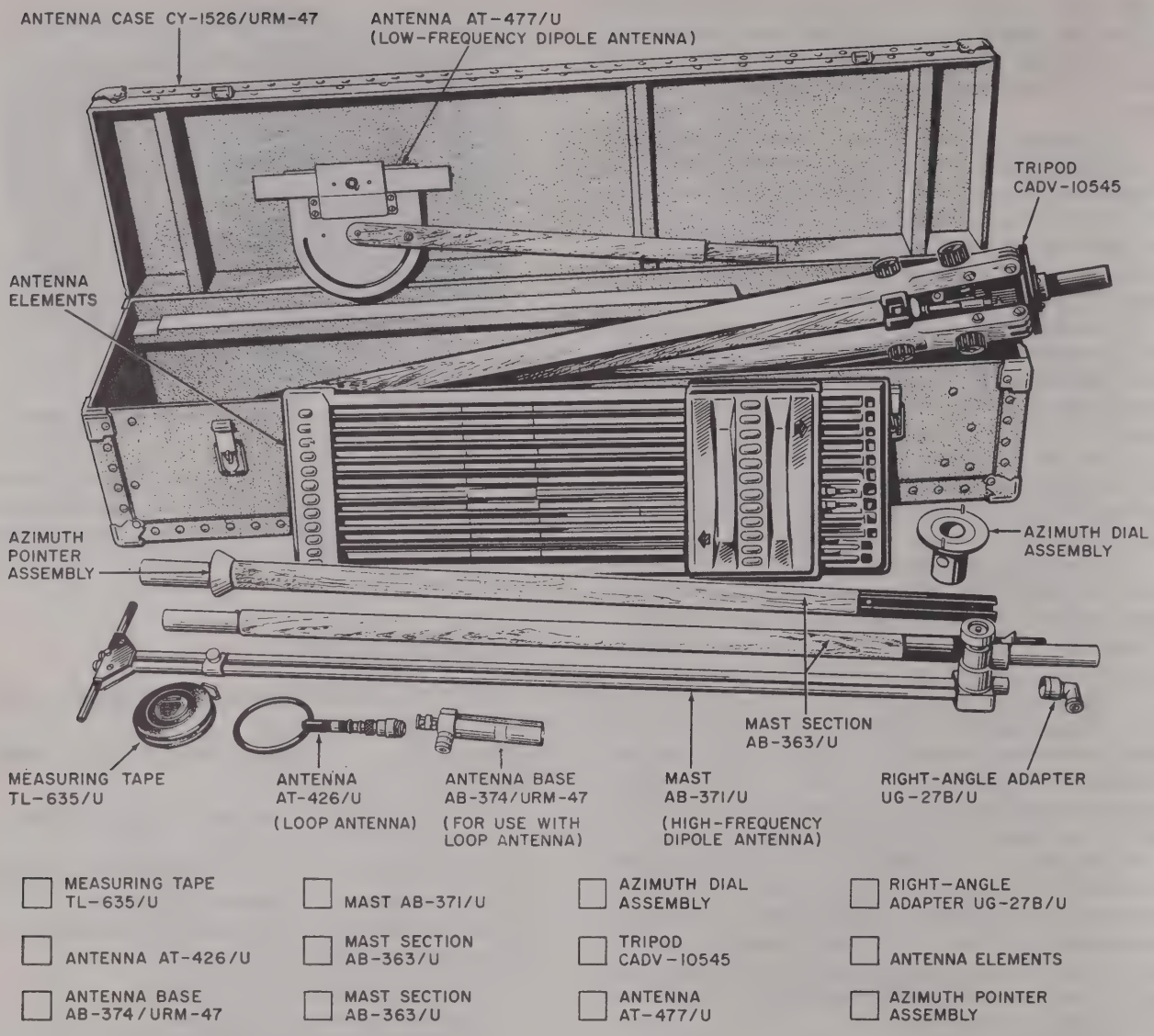


Figure 1-6. Antenna Case CY-1526/URM-47, Contents Displayed

one microvolt from 20 to 145 mc, two microvolts from 145 to 240 mc, seven microvolts from 240 to 400 mc.

l. SELECTIVITY.—Bandwidth at 6 db down from signal level: 138 kc to 175 kc wide throughout all six bands.

m. ACCURACY OF MEASUREMENT.—The accuracy of measurement of continuous wave amplitude modulation, modulated and unmodulated signals, is ±15 per cent or better at signal levels above 10 microvolts when compared to similar outputs from standard signal generators in proper operating condition. Equal accuracy or better is obtained when measuring impulsive signals directly in terms of microvolts-per-kilocycle; these measurements, taken with the PEAK function, are independent of pulse repetition rate.

n. SPURIOUS RESPONSE REJECTION. — Better than 40 db.

o. I-F REJECTION.—Greater than 60 db.

p. AUDIO OUTPUT.—More than 100 milliwatts into a 600-ohm, non-inductive load based on an output meter indication of 10 microvolts and r-f signal input modulated 30 per cent, 1000 cps.

q. OSCILLOSCOPE OUTPUT.—Frequency response flat within 3 db from 20 to 100,000 cps depending on oscilloscope loading.

r. DYNAMIC RANGE OR OVERLOAD.—20 db ± 2 db at full scale.

s. EFFECTIVE RANDOM INTERFERENCE BANDWIDTH.—Varies between 110 and 150 kc, depending upon frequency.

t. TYPE OF RECEPTION.—Carrier, modulated carrier, pulse, or radio interference (noise).

u. INPUT IMPEDANCE.—50 ohms (coaxial). A turret type step attenuator built into the input circuit provides attenuation of the input signal in the following step ratios: 1, 10, 100, 1000, and 10,000. Each step is an electrical continuation of the 50-ohm coaxial line.

v. SHIELDING.—The shielding effectiveness as referred to the equipment sensitivity using a tuned dipole, is 60 db or better.

w. ELECTRICAL CHARACTERISTICS OF RECOMMENDED ANTENNAS.—The dipole antennas furnished with the equipment shall be used. Other antennas of similar characteristics may be used, but these will require calibration if they are to be used for quantitative measurements.

x. POWER SUPPLY REQUIREMENTS.

(1) VOLTAGE.—105-125 volts rms, or 210-250 volts rms.

(2) PHASE.—Single phase.

(3) FREQUENCY.—50-60 cps or 400 cps.

(4) POWER.—Approximately 115 watts at 115 volts, 60 cps.

y. HEAT DISSIPATION.—Approximately 115 watts.

TABLE 1-1. EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	AN DESIGNATION	OVERALL DIMENSIONS			VOLUME (Cu Ft)	WEIGHT (Pounds)
			HEIGHT (In.)	WIDTH (In.)	DEPTH (In.)		
1	Radio Interference Measuring Set consisting of:	AN/URM-47A					
1	Test Set Case containing:	CY-1527/URM-47	13-1/2	23-3/4	11-5/16	2.1	50
1	Radio Interference-Field Intensity Meter	IM-88/URM-47	7-5/8	19-13/16	10-3/8		
1	Headphones (GFE)	Navy Type —49753 or equivalent					
2	Chart Set	PT-188/URM-47					
2	Instruction Book	NAVSHIPS 92147	11	8-1/2			
1	Accessories Case containing:	CY-1525/URM-47	16-1/8	15-1/2	10-5/8	1.54	46
1	Power Supply	PP-906A/URM-47	7-17/32	10-1/2	8-3/8		
1	Ammeter	ME-76/U					
1	Antenna Base	AB-364/U					
1	Radio Frequency Cable Assembly	CG-1064/U (1′ 6″)					
1	Assembly	CX-3810/U (6′ 6″)					
1	Cable Assembly	CG-573/U (3′ 0″)					
1	Cable Assembly	CG-572/U (20′ 0″)					
1	Cable Assembly	CG-571/U (20′ 0″)					
1	Cable Assembly	91487-1 (10′ 0″)					
1	Cable Assembly	CG-92D/U (20′ 0″)					
1	Antenna Case containing:	CY-1526/URM-47	10	40-1/2	10-1/2	2.46	36
1	Mast	AB-371/U					
1	Antenna	AT-477/U					
2	Mast Section	AB-363/U					
1	Tripod	CADV-10545					
1	Antenna	AT-426/U					
1	Antenna Base	AB-374/URM-47					
1	Measuring Tape	TL-635/U					
1	Right-Angle Adapter	UG-27B/U					
1	Azimuth Dial Assembly						
1	Azimuth Pointer Assembly						
1 Set	Antenna Elements						

TABLE 1-2. SHIPPING DATA

SHIPPING BOX NO.	CONTENTS		OVERALL DIMENSIONS			VOLUME (Cu Ft)	WEIGHT (Pounds)
	NAME	DESIGNATION	HEIGHT (In.)	WIDTH (In.)	DEPTH (In.)		
1	Accessories Case Antenna Case Test Set Case	CY-1525/URM-47 CY-1526/URM-47 CY-1527/URM-47	18-7/8	48-3/4	26-1/4	13.9	215

TABLE 1-3. ELECTRON TUBE COMPLEMENT

ELECTRON TUBE TYPE	SYMBOLS INVOLVED	QUANTITY PER EQUIPMENT	RI-FI METER IM-88/ URM-47	POWER SUPPLY PP-906A/ URM-47	DESCRIPTION
OA2WA	V122	1	1		Voltage regulator
OB2WA	V301	1		1	Voltage regulator
1N63	CR101	1	1		Germanium crystal rectifier
5718	V105	1	1		Reliable subminiature 500-mc medium-mu triode
5726/6AL5W	V111	1	1		Reliable miniature twin diode
5814A	V116 V121	2	2		Reliable miniature twin triode
5840	V101 V102 V103 V104	4	4		Reliable subminature 400-mc r-f pentode sharp cut-off
6AU6WA/6AU6	V113	1	1		Reliable miniature r-f pentode, sharp cutoff
6BH6	V106 V107 V108 V109 V115 V117	6	6		Miniature r-f pentode
6005/6AQ5	V110	1	1		Power amplifier pentode
6C4	V112 V114 V119 V120	4	4		Reliable miniature high-frequency triode
Totals		23	22	1	

SECTION 2

THEORY OF OPERATION

2-1. INTRODUCTION.

Radio Interference Measuring Set AN/URM-47A can be used to measure the field intensity of a given radio transmission or to measure the intensity of radiated or conducted radio interference. It can also be used as a sensitive r-f microvoltmeter within its frequency range. Some reference to the nature of these quantities is given here, with a brief description of the methods of measurement employed.

a. The position of the transmitting antenna in space with respect to the earth determines the polarization of the emitted wave. A vertical antenna radiates a wave consisting of a vertical electric field vector and a horizontal magnetic field vector. A horizontal antenna radiates a horizontally polarized wave consisting of a horizontal electric field and a vertical magnetic field.

When the transmitting and receiving antennas are close to the ground, vertically polarized waves yield a stronger signal than do horizontally polarized waves. Using a transmitting antenna several wave-lengths above ground, horizontally polarized waves result in a stronger signal close to the earth than is possible with vertical polarization.

A radiated field intercepted by a vertical antenna will set electrons in motion in the antenna. This electron flow constitutes a current that varies in accordance with the variations of the field. In this case, the induced current in the rod antenna is not uniform but becomes zero at the top. The voltage effective in producing the current measured at the antenna base is equal to an effective height times the electric intensity of the field. The effective height of an antenna can be described as the calculated true electrical height, corresponding to a perfect antenna that will produce the same field intensity.

When a loop antenna is used, the magnetic component of the radiated field induces a voltage in the loop. The loop output voltage is a function of its area, number of turns, and frequency of excitation.

Vertical rod and loop antennas may be used for field intensity measurements in the portion of the radio spectrum (20 to 400 mc) under discussion. Field intensity is the value of the electric field at a given point and is measured in terms of volts-per-meter. One volt-per-meter is equivalent to a potential of one volt induced in a vertical rod antenna having an effective electrical length of one meter.

There are two principal methods of making field intensity measurements. One method is the substitution method, in which a loop antenna is connected to a receiver and metering circuits give an indication of the receiver input. The receiver is tuned to the desired signal, the loop is rotated to give maximum signal, and then the indicated value of the received signal is recorded. The loop is then rotated to give minimum received signal, and a signal generator is inserted in series with the loop. The signal generator is tuned to the received frequency and its output adjusted to obtain the same reading of signal input as was obtained with maximum loop signal. The field intensity in microvolts-per-meter is computed from the formula:

$$E = \frac{V}{H\ (eff)}$$

where V is the value of the substitute signal in microvolts and H (eff) is the effective height, obtained from tables or computed as follows:

$$H\ (eff) = 1.351\ ANF \times 10^{-8}$$

where A= area of one turn of loop winding in square inches, N = number of turns, F = frequency in kilocycles, and H (eff) is in meters. The second method of field intensity measurement, as employed in Radio Interference Measuring Set AN/URM-47A, uses a specially designed sensitive receiver with built-in attenuators and a calibrating voltage source. The RI-FI Meter is tuned to the desired frequency and the calibrating voltage is applied to the r-f input. The calibrating signal output is standardized by adjustment of the gain in the i-f section. The calibrating signal voltage is turned off and the antenna is connected to the RI-FI Meter input.

The attenuators are adjusted, if possible, for a meter indication at the upper half of the indicating meter dial, and the meter reading thus obtained, multiplied by the attenuator setting, is the field intensity in microvolts-per-meter of the received signal. This method is advantageous in that the accuracy is independent of signal frequency, and depends primarily upon the attenuator and the linearity of the RI-FI Meter circuits. Details of these circuits are discussed in paragraph 2-3.

b. Radio interference is defined as an electrical disturbance which causes undesirable response or malfunctioning of electronic equipment. Electronic equipments

include radio, radar, sonar, television, electronic detection and recognition, telemetering and control equipments which employ radio frequency energy transmitted through space or other media for their proper functioning. Interference includes many forms of disturbances and may be roughly classified as continuous and discontinuous. Continuous disturbances include random interference, such as thermal agitation. Atmospheric interference, or static, originating in lightning discharges in local storms and in more distant tropical storms, resembles random interference in that the impulses are frequent and overlap, with sharp peaks exceeding the average level. If interference impulses follow each other rapidly and are not clearly distinguishable, then the interference is random.

Discontinuous interference can be considered to be made up of sharp pulses, the pulse frequency determining the character of the interference. If the pulses are relatively infrequent and clearly separated, the interference is termed impulsive. Impulsive interference may be generated by an internal combustion engine ignition system, power line discharges, electrical switching operations, electronic equipment, and by other electrical and electro-mechanical devices.

Because the frequency spectrum of continuous and discontinuous interference can be extremely wide, the interference magnitude will depend upon the bandwidth of the measuring equipment. The bandwidth characteristics of Radio Interference Measuring Set AN/URM-47A are taken into consideration and are utilized in obtaining average, quasi-peak, and peak values of interference. The procedure for interference measurement is similar to that of field intensity measurement. It is desirable to obtain average, quasi-peak, and peak readings of interference in order to determine the type of disturbance.

Note

A quasi-peak indication represents the "nuisance" value of interference. This measurement is dependent upon the time constants of the second detector circuit and of the indicating meter and is generally less than the "peak" value of the interference. The meter indicating instrument response time is 275 $\pm$75 milliseconds. The circuit time constant is one millisecond charge and 600 milliseconds discharge. The meter time constant is 150 milliseconds or less. These time constants have been generally accepted in the RI-FI Meter design.

2-2. GENERAL THEORY OF OPERATION.

(See figures 2–1 and 2–2.)

a. GENERAL.—Throughout this section refer to the complete block diagram, figure 2–1, which shows in detail the relationship of the various circuits within Radio Interference Measuring Set AN/URM-47A.

b. R-F INPUT ANTENNAS. *(See figure 2–2.)*—Input devices for Radio Interference Measuring Set AN/URM-47A include high- and low-frequency dipole antennas, a loop probe antenna, and a ground plane vertical antenna.

The high-frequency dipole antenna, Mast AB-371/U, is used with frequency Bands 4, 5, and 6 (88 to 400 mc). The low-frequency dipole antenna, Antenna AT-477/U, is used with frequency Bands 1, 2, and 3 (20 to 88 mc). Both dipoles can be tuned to resonance at any frequency within their respective bands. The dipole antennas have self-contained baluns to transform the symmetrical dipole output into an asymmetrical output suitable for loading with a 50-ohm coaxial transmission line. Meter indications obtained when employing the dipole antennas are to be modified by a factor as determined from the calibration charts. The low-frequency dipole antenna is constructed so that it can also be used for field intensity measurements from 20 to 50 megacycles in confined spaces, employing a fixed-length dipole (tuned to 50 megacycles). A low dipole factor is retained by "tuning out" the capacitive reactance of a short dipole at each frequency by means of a series variable inductance connected between the antenna terminals and the impedance transforming balun.

The loop probe antenna, Antenna AT-426/U, is used within the entire frequency range of the equipment, 20 to 400 mc. It is provided with an insulating coating for probing among uninsulated conductors. Although a calibration chart is supplied for the loop probe antenna, these factors should be considered approximate only and its use is generally limited to relative measurements.

The ground plane vertical antenna, Antenna Base AB-364/U, is an omnidirectional antenna to be used for the entire frequency range of the equipment. A calibration chart (see Chart Set PT-188/URM-47) supplied determines the number of the various antenna extensions to be added to tune the antenna at the desired frequency.

c. RADIO INTERFERENCE-FIELD INTENSITY METER IM-88/URM-47.—The RI-FI Meter consists of a highly sensitive h-f and v-h-f superheterodyne radio receiver covering the frequency range of 20 to 400 megacycles.

Measurements can be made with the RI-FI Meter in terms of the peak value of the signal or interference (the PEAK function of the meter), in terms of the weighted value (the QUASI PEAK function, or in terms of the average value (the FIELD INTENSITY function). These functions are selected by means of the function switch. The meter contains internal means for calibrating or standardizing its gain. It is standardized in the CAL position of the function switch at the frequency of operation.

The RI-FI Meter indicating meter scale is directly calibrated for a two-decade, approximately logarithmic range of 1 to 100 microvolts (top scale), and an approximately linear 0 to 40 db (bottom scale) range.

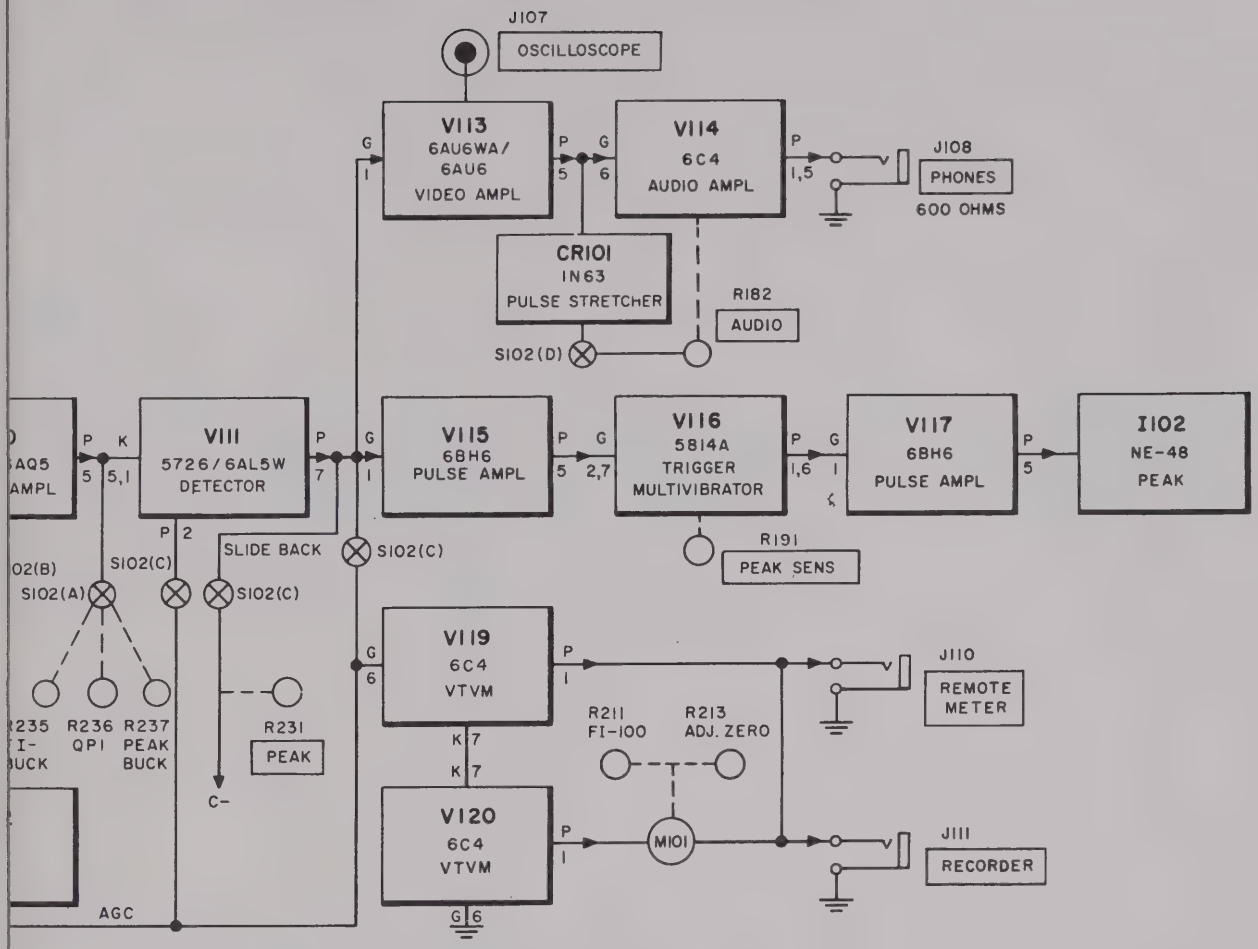


Figure 2-1. Radio Interference Measuring Set AN/URM-47A, Overall Block Diagram

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The RI-FI Meter indicating meter scale is directly calibrated for a two-decade, approximately logarithmic range of 1 to 100 microvolts (top scale), and an approximately linear 0 to 40 db (bottom scale) range.

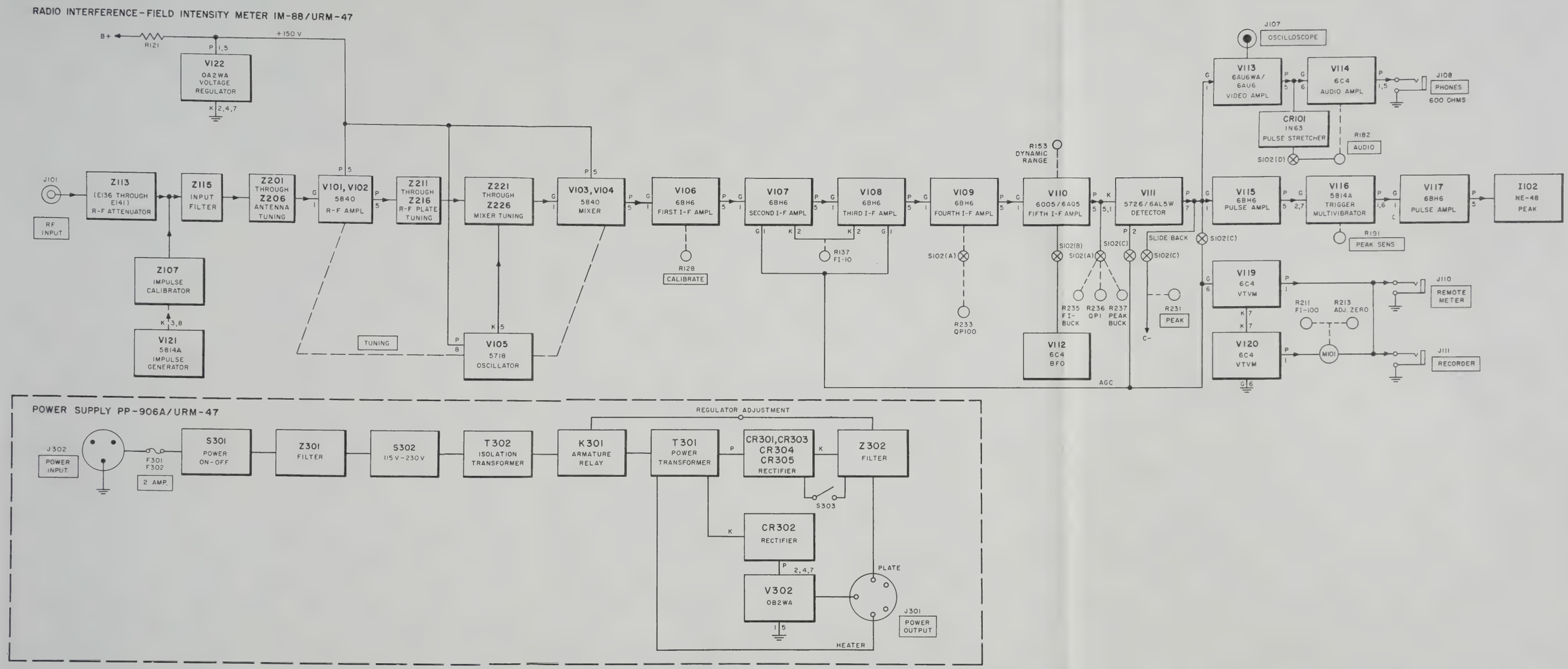
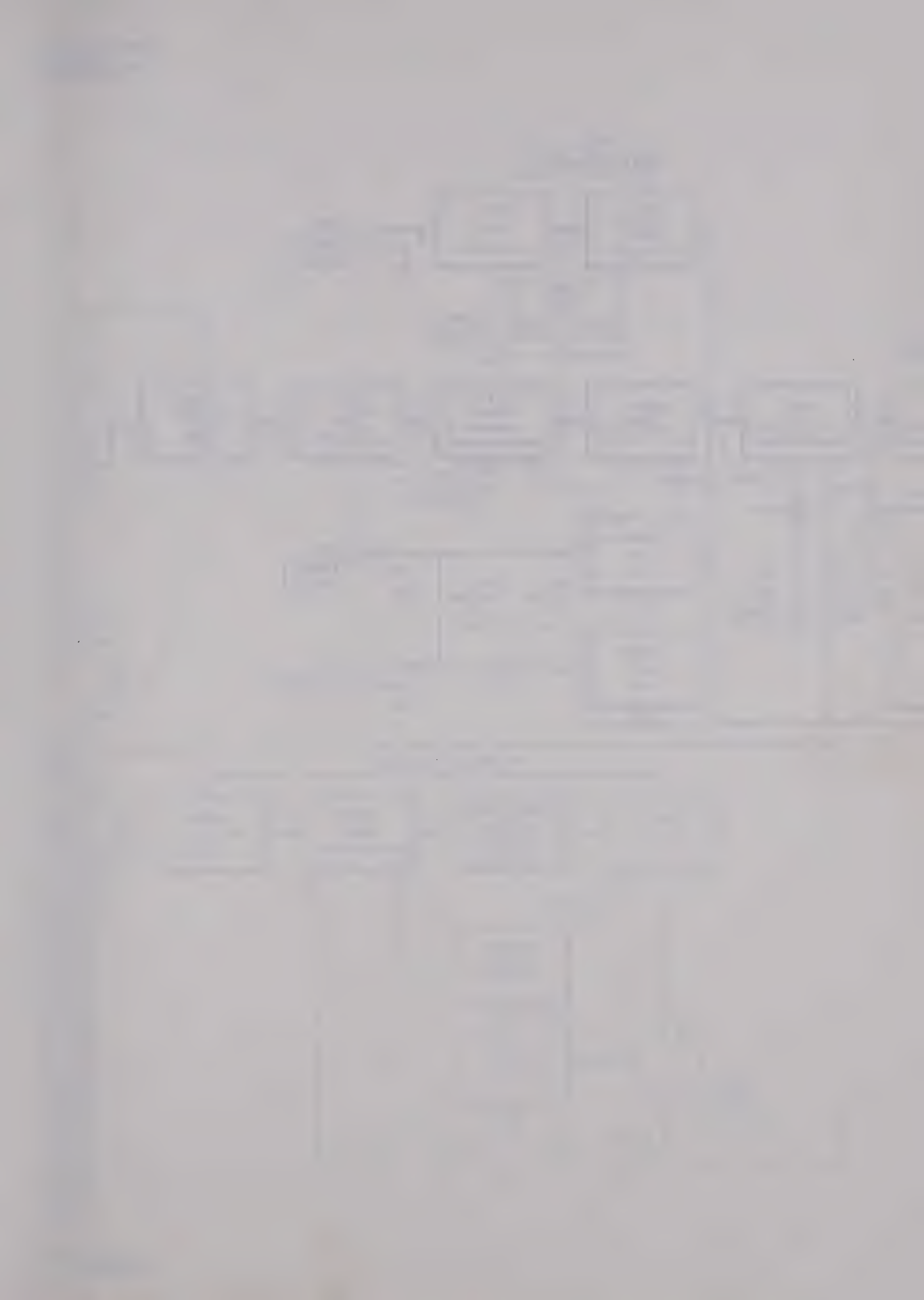


Figure 2-1. Radio Interference Measuring Set AN/URM-47A, Overall Block Diagram



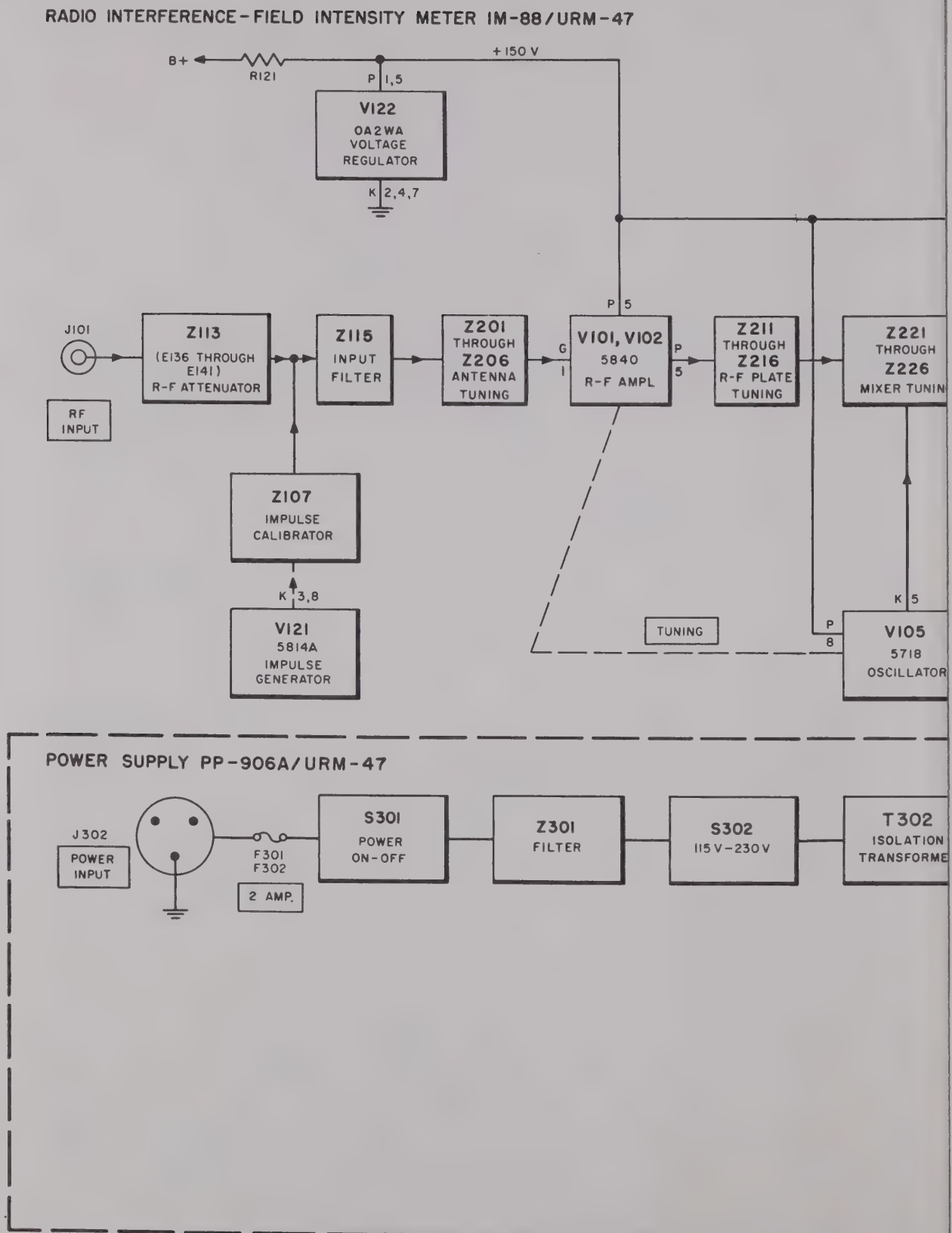


Figure 2-1. Radio Interference-Measuring Set AN/URM-47A, Overall Block Diagram

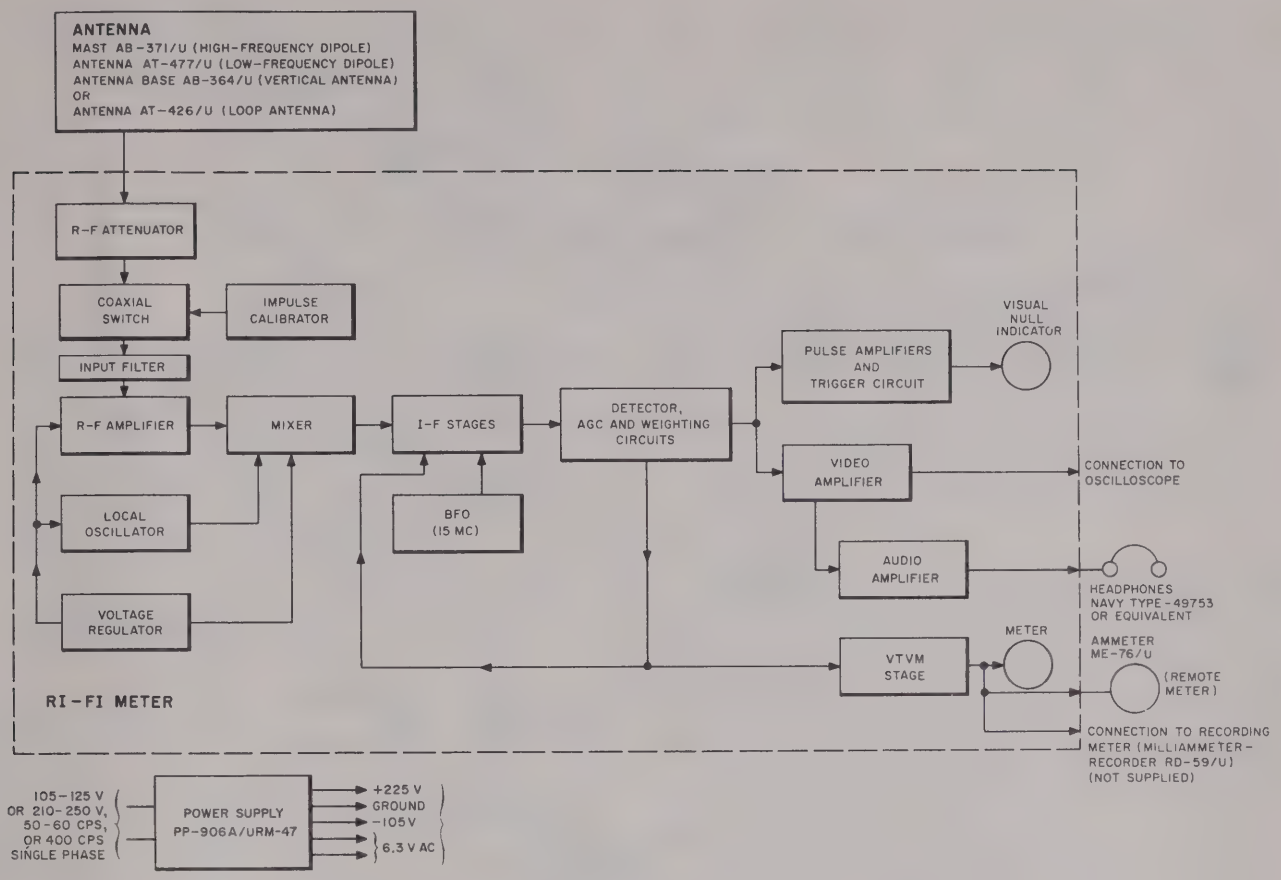


Figure 2-2. Radio Interference Measuring Set AN/URM-47A, Simplified Block Diagram

The inherent sensitivity of the RI-FI Meter is one microvolt on Bands 1 through 5 and approximately two to five microvolts on Band 6.

d. SIGNAL CHANNEL IN RI-FI- METER.—The signal channel closely resembles a superheterodyne radio receiver in its r-f, i-f, and a-f circuits but differs from most superheterodyne receivers in its provision for r-f attenuation and detector output measurement.

The r-f signal or interference (hereafter called signal) as picked up by the antenna is delivered to the RF INPUT receptacle. The r-f signal passes through the r-f stage, and is mixed with the local oscillator frequency in the mixer stage to produce the intermediate frequency of approximately 15 megacycles. The intermediate frequency is the same as the BFO crystal frequency so that by use of the BFO a weak signal may be tuned to a null (or near null to produce an audible note), and then the strength of the signal accurately measured with the function switch in the FIELD INTENSITY or QUASI PEAK position. The i-f signal is amplified in five i-f stages and demodulated in the detector stage. The demodulated signal is acted upon by the meter detector weighting circuits and applied to the VTVM stage, thus actuating the meter. The audio components of the signal are subsequently amplified and delivered to the PHONES jack.

F-m signals may be received with reasonable audio quality through the use of "slope detection". This not only simplifies circuitry and minimizes maintenance parts, but also provides fair quality without involved circuits and additional adjustments.

The internal calibrator supplies an impulsive calibrating voltage that follows the same signal path from r-f stage to indicating meter. With the calibrator on (function and attenuator switches in CAL position), the gain of the i-f section can be adjusted.

The built-in step attenuator provides the following step ratios: 1, 10, 100, 1000, and 10,000. The attenuation is obtained in the input to the r-f and i-f stages. The attenuation steps are listed as follows:

R-f Attenuator Settings	*Attenuation in db*	
	R-f	*I-f*
CAL	0	20
X1 ±0DB	0	0
X10 ±20DB	0	20
$X10^2$ ±40DB	20	20

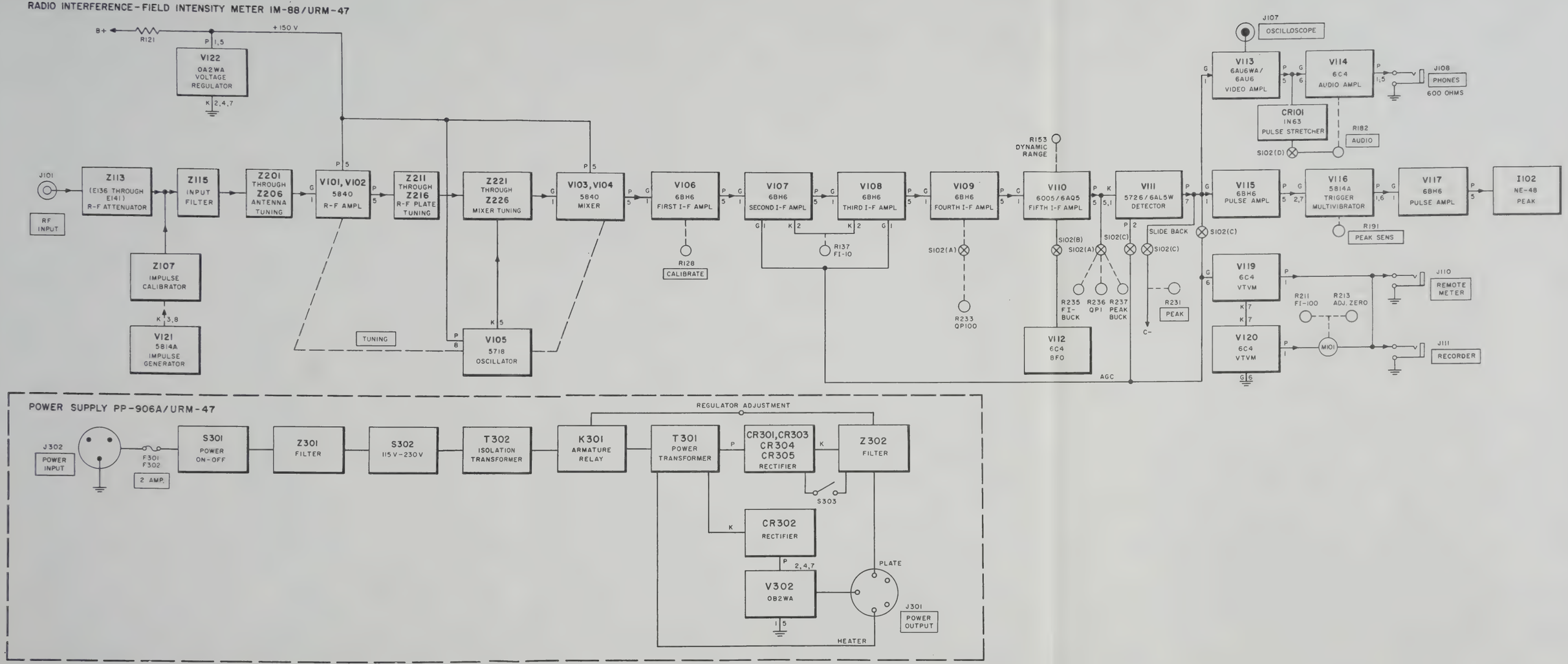
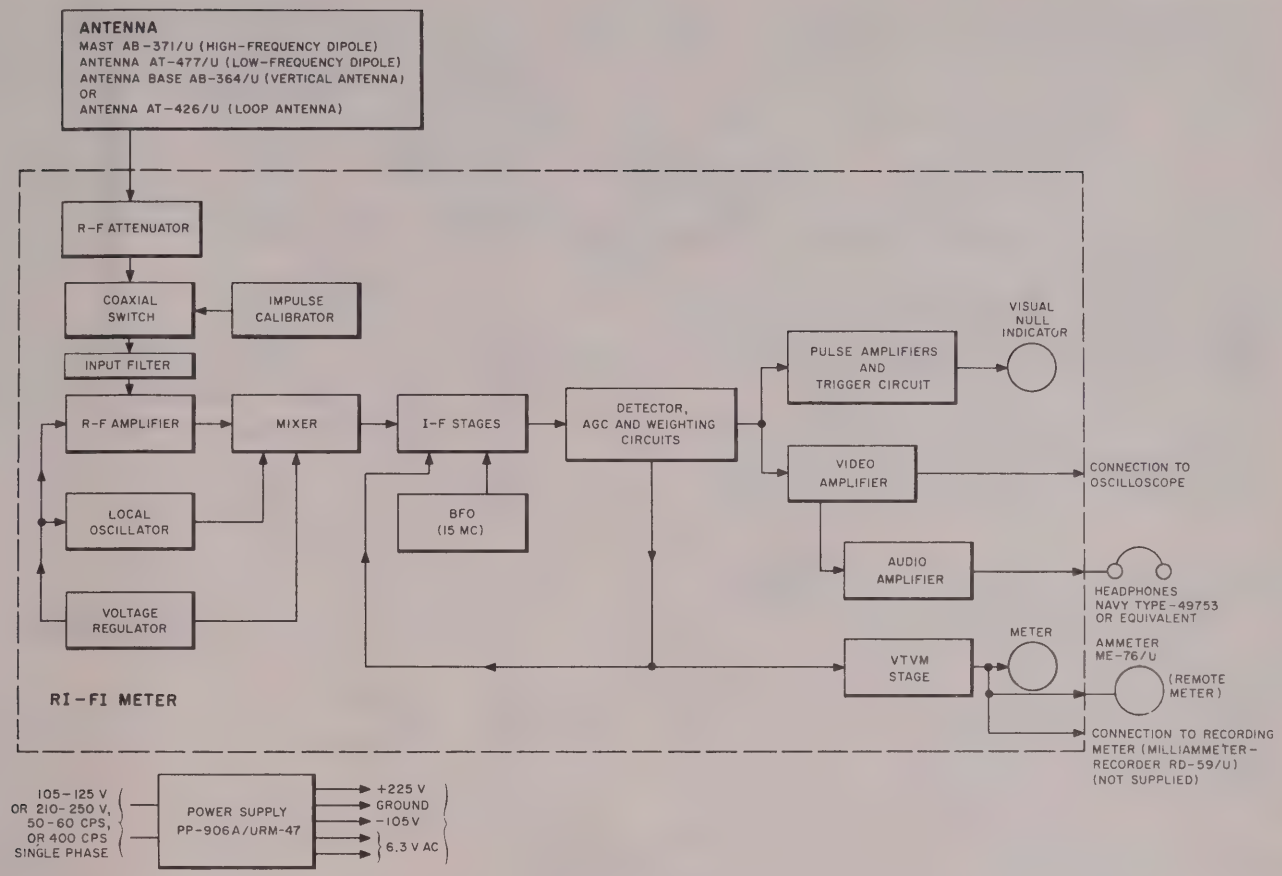


Figure 2-1. Radio Interference-Measuring Set AN/URM-47A, Overall Block Diagram



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The inherent sensitivity of the RI-FI Meter is one microvolt on Bands 1 through 5 and approximately two to five microvolts on Band 6.

d. SIGNAL CHANNEL IN RI-FI- METER.—The signal channel closely resembles a superheterodyne radio receiver in its r-f, i-f, and a-f circuits but differs from most superheterodyne receivers in its provision for r-f attenuation and detector output measurement.

The r-f signal or interference (hereafter called signal) as picked up by the antenna is delivered to the RF INPUT receptacle. The r-f signal passes through the r-f stage, and is mixed with the local oscillator frequency in the mixer stage to produce the intermediate frequency of approximately 15 megacycles. The intermediate frequency is the same as the BFO crystal frequency so that by use of the BFO a weak signal may be tuned to a null (or near null to produce an audible note), and then the strength of the signal accurately measured with the function switch in the FIELD INTENSITY or QUASI PEAK position. The i-f signal is amplified in five i-f stages and demodulated in the detector stage. The demodulated signal is acted upon by the meter detector weighting circuits and applied to the VTVM stage, thus actuating the meter. The audio components of the signal are subsequently amplified and delivered to the PHONES jack.

F-m signals may be received with reasonable audio quality through the use of "slope detection". This not only simplifies circuitry and minimizes maintenance parts, but also provides fair quality without involved circuits and additional adjustments.

The internal calibrator supplies an impulsive calibrating voltage that follows the same signal path from r-f stage to indicating meter. With the calibrator on (function and attenuator switches in CAL position), the gain of the i-f section can be adjusted.

The built-in step attenuator provides the following step ratios: 1, 10, 100, 1000, and 10,000. The attenuation is obtained in the input to the r-f and i-f stages. The attenuation steps are listed as follows:

R-f Attenuator Settings	*Attenuation in db*	
	R-f	*I-f*
CAL	0	20
X1 ±0DB	0	0
X10 ±20DB	0	20
$X10^2$ ±40DB	20	20

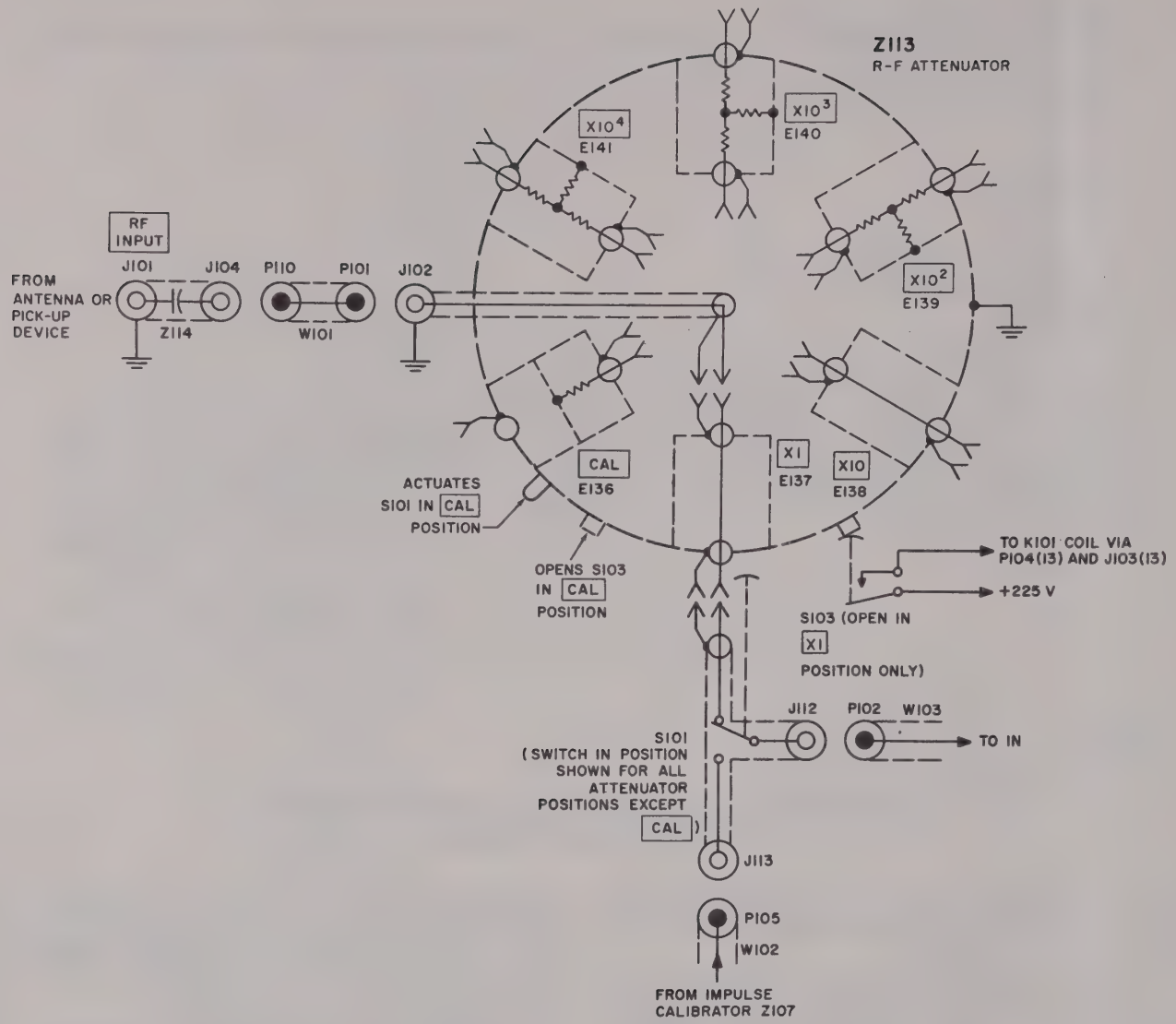


Figure 2-3. R-f Attenuator and Input Stages, Simplified Schematic Diagram

R-f Attenuator Settings	*Attenuation in db*	
	R-f	*I-f*
$X10^3$ +60DB	40	20
$X10^4$ +80DB	60	20

2-3. DETAILED THEORY OF OPERATION, RI-FI METER.

(See figures 2–1 through 2–35.)

The individual circuits of the RI-FI Meter are described in the following subparagraphs.

a. R-F ATTENUATOR AND INPUT STAGES. *(See figure 2–3.)*—The r-f attenuator Z113 consists of an assembly of six metal tubes (E136 through E141) mounted in a turret arrangement on a central shaft which imparts both rotational and linear motion to the assembly. Of the six tubes, three contain T-section resistive networks, two are "straight-through" sections for zero attenuation, and one provides for the injection of a calibrating signal generated within the unit. Selection of each step of attenuation is accomplished by a pull-turn-push sequence in the actuation of the shaft (by means of the PULL-TURN-PUSH control of the r-f attenuator Z113). Smooth, positive positioning is accomplished by a spring-loaded detent.

The resistive elements sealed within the tubes are special one-watt resistors consisting of thin metallic films on ceramic discs. Their precision resistance values are maintained throughout the frequency range of the equipment, 20 to 400 megacycles.

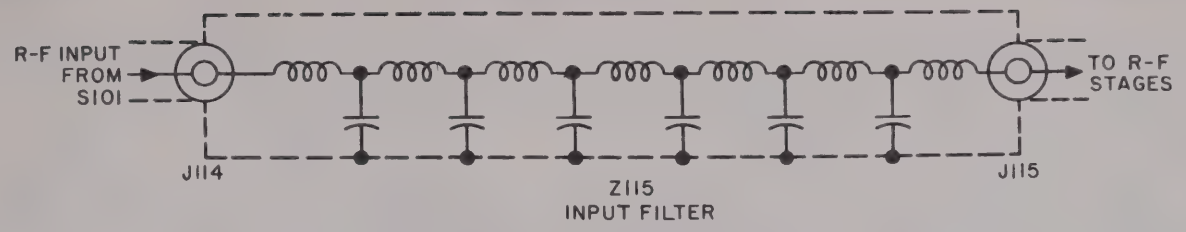


Figure 2-4. Input Filter Stage, Simplified Schematic Diagram

Note

Tests have indicated that the attenuator pads easily handle one watt of sine wave power, but that a different condition exists on pulse type inputs. It is not the average *power* of a sharply pulsed signal which damages the attenuator elements, but the peak voltage of the signal. The type of resistive elements used is such that with a pulse of 1000 pps at four microseconds duration, the maximum peak *voltage* which can be accommodated is about 100 volts applied to the input connector.

The six positions of the attenuator are listed in the following table with the corresponding amounts of attenuation presented to the r-f input signal. It is to be noted that the *attenuation listed here is the attenuation presented by the r-f attenuator Z113 alone;* subsequent attenuation is introduced at the input to the i-f stages (see subparagraph 2-3.*d,* following).

Position	*R-f Attenuation (db)*
CAL	*
X1 +0DB	0
X10 +20DB	0
$X10^2$ +40DB	20
$X10^3$ +60DB	40
$X10^4$ +80DB	60

*In the CAL position of the attenuator, the input signal is terminated into 50 ohms resistive load within tube E136; this is done to prevent leakage of any input signal into the r-f circuits during calibration procedures.

The input signal from one of the antennas or pickup devices is fed into the RF INPUT jack J101 (part of coupling section Z114) and then via J104 (also part of Z114) through cable W101 and its associated connectors P110 and P101 to the signal input connector J102 of the r-f attenuator (see figure 2–3). At this point, the input signal passes through the attenuator tube (E137 through E141) selected by the r-f attenuator PULL-TURN-PUSH control Z113 to the coaxial switch S101 on the rear of the assembly.

Note

If the CAL position of the attenuator control has been selected, the incoming signal will terminate into 50 ohms resistive load in tube E136.

In all positions of the attenuator control except CAL, switch S101 is closed to deliver the input signal to the r-f stage via coaxial connectors J112 and P102.

In the X1 position, a pin on the attenuator turret assembly actuates switch S103 (i.e., opens the normally closed switch) to de-energize relay K101 in the first i-f amplifier stage. When relay K101 becomes de-energized, its contacts remove the additional attenuation provided for in that system (see subparagraph *2-3.d,* following). In all other positions, S103 is not actuated.

In the CAL position, another pin on the attenuator turret assembly actuates coaxial switch S101 to connect J112 to J113. This permits the calibrating signal from the impulse calibrator Z107 to be injected into the r-f stage for calibrating purposes.

b. INPUT FILTER STAGE. *(See figure 2–4.)*—The input filter Z115 is a transmission line low-pass filter for attenuating frequencies above the tuning range of the RI-FI Meter. It uses sections of coaxial line having large impedance with respect to 50 ohms as inductance elements and sections of coaxial line having small impedance with respect to 50 ohms as capacitance elements. It consists of six constant-K sections, including matching input and output sections. The nominal cutoff frequency of this filter is 470 megacycles.

c. R-F STAGES. *(See figures 2–5 through 2–9.)*—

Note

In the following paragraphs, the description of the operation will be made in terms of only one of the six combinations of tuning elements on any turret assembly. The operation in the other five bands (i.e., for other combinations) is the same in all cases.

(1) GENERAL. *(See figure 2–5.)*—The r-f stages consist of the impedance matching network (Z200), the push-pull r-f amplifiers V101 and V102 (with tuned input and output circuits), local oscillator V105, and the push-pull mixers V103 and V104 (with tuned input

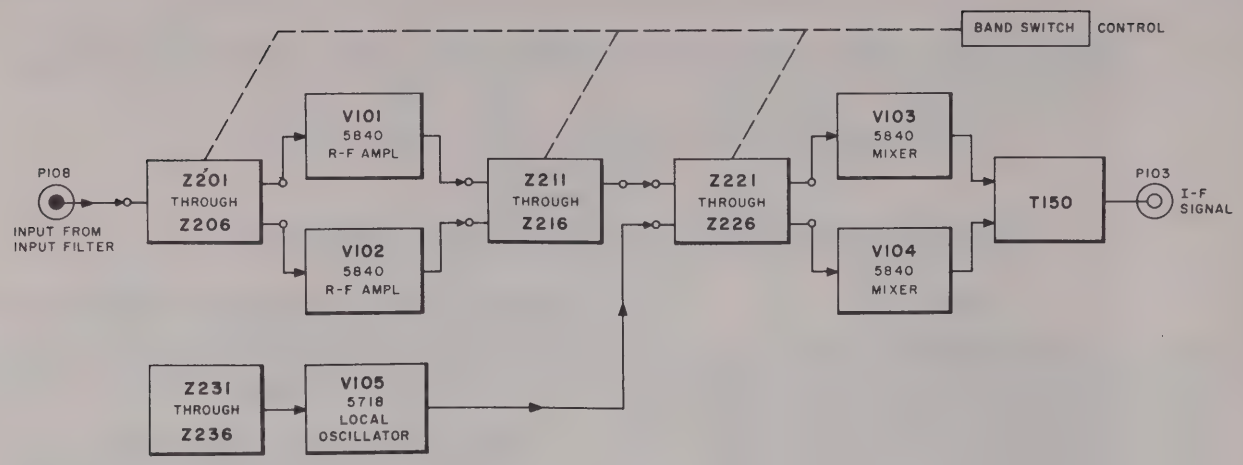


Figure 2-5. R-f Stages, Block Diagram

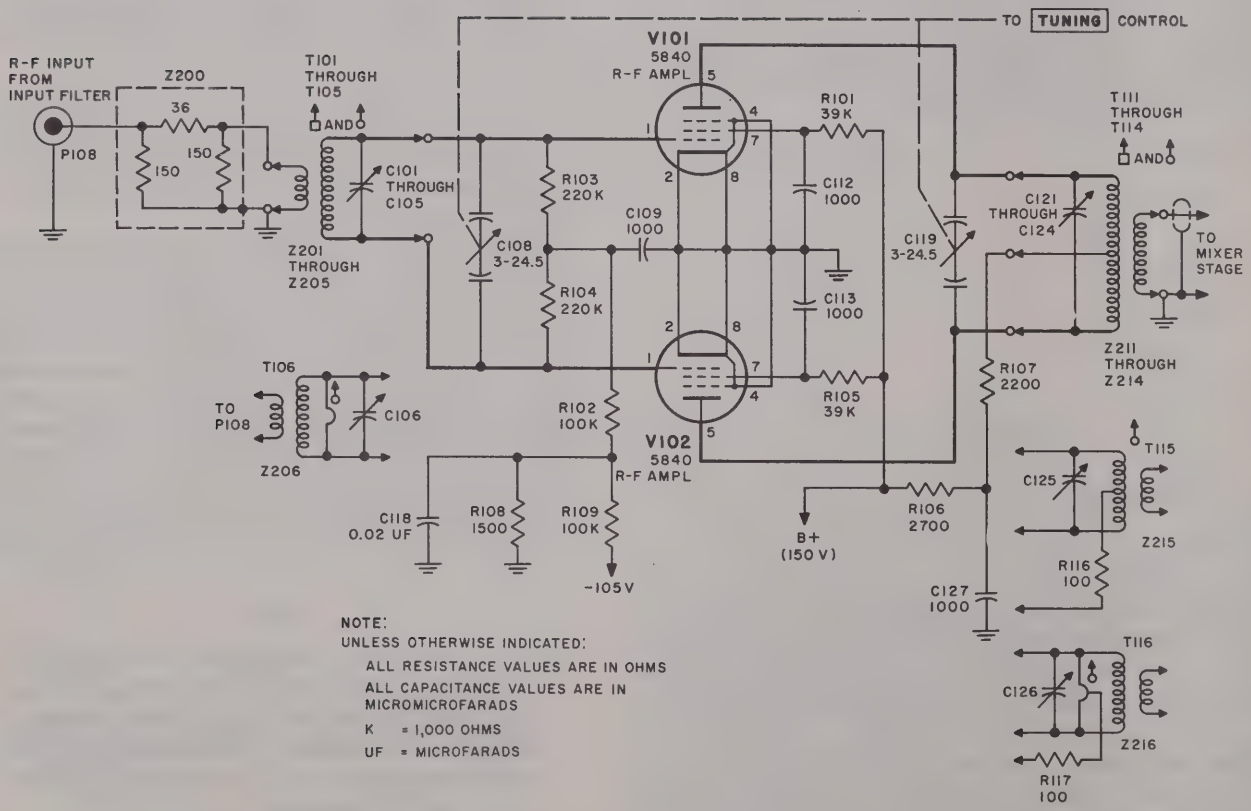


Figure 2-6. R-f Amplifier Stage, Simplified Schematic Diagram

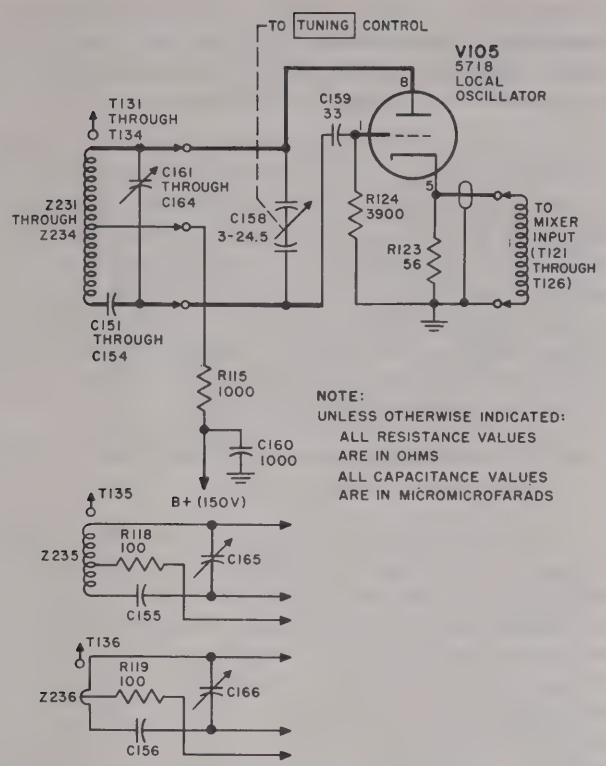


Figure 2-7. Local Oscillator Stage, Simplified Schematic Diagram

circuit). The impedance matching network consists of three composition resistors which serve to maintain the input impedance at a relatively constant value throughout the frequency range of the equipment. Each of the tuned circuits consists of a tuning capacitor and a turret assembly of six transformer and trimmer capacitor combinations (one combination for each band). The tuning capacitors are ganged and are driven by the TUNING control (H). Each tuned circuit (i.e., capacitor and its turret assembly) is contained within a shielded compartment of the r-f head. The turret assemblies are ganged and are driven by the BAND SWITCH control (G).

(2) R-F AMPLIFIER STAGE. *(See figure 2–6.)*—The r-f signal from S101 on the attenuator assembly is applied through P102 to the primary winding of T101 whose secondary is tuned by C108 (C101 is the associated trimmer). The r-f signal is applied directly to the grids of V101 and V102. These grids are biased negatively from the −105-volt supply through the voltage divider composed of R109 and R108, and through the grid resistors R102, R103, and R104. The amplified output, taken from the plates of V101 and V102, is applied to the tuned output circuit C119, T111, and C121. The output from T111 is coupled by means of a link at a low impedance level to the succeeding mixer stage.

(3) LOCAL OSCILLATOR STAGE. *(See figure 2–7.)*—The local oscillator stage consists primarily of triode V105, transformer T131, tuning capacitor C158, and trimmer C161 arranged in a modified Colpitts cir-

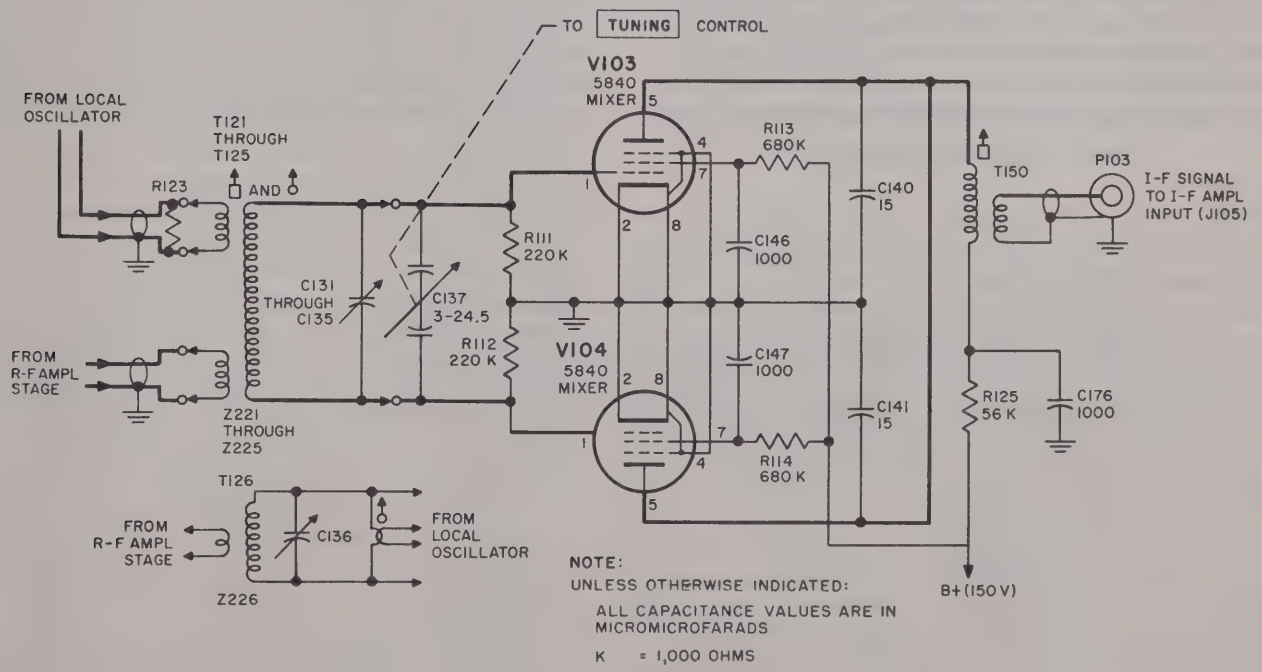


Figure 2-8. Mixer Stage, Simplified Schematic Diagram

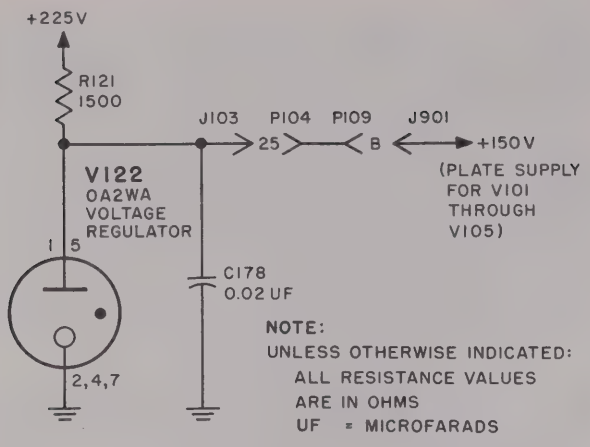


Figure 2-9. Voltage Regulator Stage, Simplified Schematic Diagram

cuit. The oscillator output is always 15 megacycles higher than the signal frequency. Grid bias is provided by resistor R124. The oscillator signal is connected from the cathode circuit at a low impedance level to the mixer stage.

(4) MIXER STAGE. *(See figure 2–8.)*—The mixer stage consists primarily of mixer tubes V103 and V104, input transformer T121, tuning capacitor C137, trimmer C131, and output coupling transformer T150. Input signals from the r-f amplifier stage and from the local oscillator stage are applied separately at a low impedance level to the two primary windings of T121. Simultaneous signals occur in the secondary winding of T121 and the two signals are applied in push-pull to the grids of V103 and V104. The i-f signal output of these tubes (difference frequency between the two input signals) is taken from the plates, connected in parallel, and applied to the primary of the output coupling transformer T150, which is tuned to the intermediate frequency of 15 megacycles. The low impedance output of the secondary winding of T150 is delivered through connector P103 to the i-f amplifier stages.

(5) VOLTAGE REGULATOR STAGE. *(See figure 2–9.)*—The plates of the tubes whithin the r-f stages (V101 through V105) must be energized from a well-regulated voltage supply in order to maintain the required stable operation. This regulated supply (+150 volts) is obtained from the +225-volt system supply (Power Supply PP-906A/URM-47) through dropping resistor R121 to the plate of voltage regulator V122. Capacitor C178 provides additional filtering and stabilizing of the regulated supply voltage.

d. I-F AMPLIFIER AND DETECTOR STAGES. *(See figures 2–10 through 2–15.)*

(1) GENERAL. *(See figure 2–10.)*—The i-f amplifier and detector stages consist of five i-f amplifiers V106 through V110, a second detector V111 and a BFO V112, all mounted on the same chassis. These stages, together with associated AGC and weighting circuits, function selector switch S102, and a calibration control R128 are shown in the block diagram of figure 2–10. The i-f amplifier circuits are all tuned to the intermediate frequency, 15 megacycles. Permeability-tuned transformer coupling is employed between all stages. The plate and heater voltage supplies of each stage are filtered and provided with decoupling networks to reduce the common impedance between stages. In this manner, feedback between stages is prevented. To provide attenuation, gain, and AGC features in the i-f system, several of the i-f stages are operated at different levels of tube operating bias. Compensation is required for the resulting Miller effect, which is evidenced by a certain amount of detuning due to variation (with signal strength) of the capacitance across the tuned grid cir-

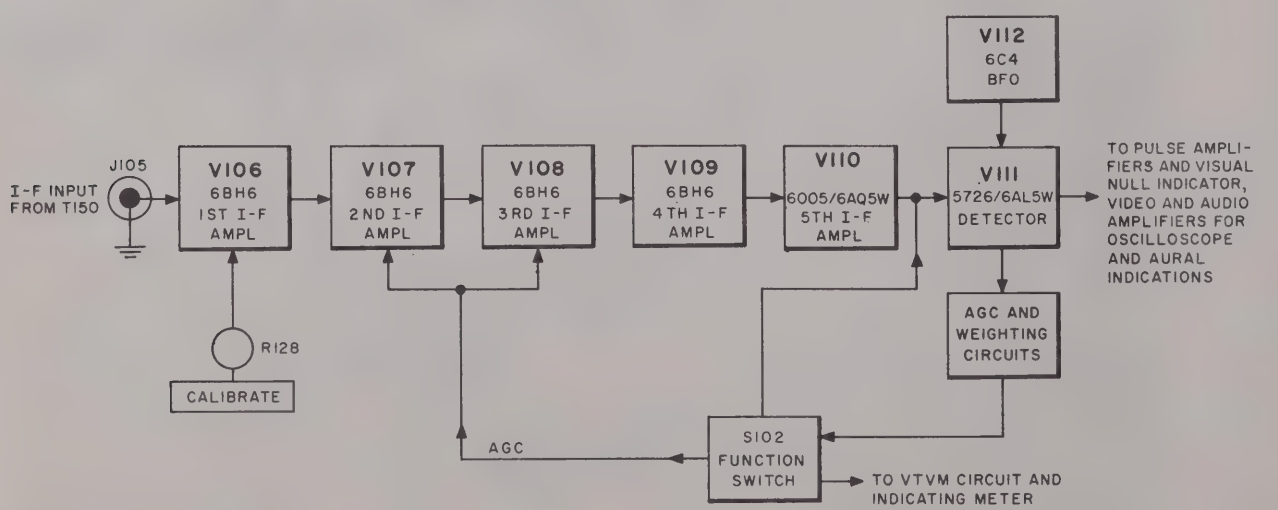


Figure 2-10. I-f Amplifier and Detector Stages, Block Diagram

cuit. In the method used here, a partially unbypassed cathode resistance in combination with the capacitance from grid to cathode of a tube introduces feedback between the cathode and grid circuits. This, in effect, reduces the capacitance between grid and ground with increasing transconductance, and thereby tends to compensate for the undesired detuning.

(2) INPUT AND FIRST I-F AMPLIFIER STAGE. *(See figure 2–11.)*—The i-f signal from the r-f stages is introduced at J105 and applied to the primary winding of transformer T151. The secondary of T151 is tuned to 15 megacycles (the intermediate frequency) by the series-connected capacitors C183 and C182. In the X1 position of the r-f attenuator, the output from the secondary of T151 is delivered to the grid of the first i-f amplifier V106 through contacts 2, 4, 8, and 6 of relay K101 whose coil is not energized (see paragraph 2-3.*a*, preceding). In effect no attenuation is introduced into either the r-f or i-f signal. In all other positions of the r-f attenuator, relay K101 becomes energized, and the grid of the first i-f amplifier is fed from the tuned circuit of T151 (junction of capacitors C183 and C182) via contacts 5 and 6 of K101. Capacitors C183 and C182 form a capacitive voltage divider to introduce an effective fixed attenuation of 20 db into the i-f input signal. At the same time capacitor C181 is connected in parallel with T151 secondary (via contacts 1 and 2 of K101). The addition of C181 compensates for the change of the grid-to-ground capacitance of i-f amplifier V106 across T151 secondary and thereby prevents detuning. Resistor R120 is connected between the junction of C182 and C183 and ground to provide a d-c return path for the grid circuit of V106; its value is chosen low enough to permit satisfactory grid current flow and high enough to prevent loading of T151. Resistor R126 constitutes the unbypassed portion of the cathode resistance (see subparagraph (1), immediately preceding). The adjustable CALIBRATE control R128 (which together with R127 forms a voltage divider) introduces a positive bias in the cathode circuit. This control functions as the gain control for the entire unit.

The first i-f amplifier stage functions primarily as a buffer stage and provides calibration control and input attenuation facilities rather than substantial gain. The output is taken from the plate of V106 and is coupled to the succeeding stage (second i-f amplifier V107) through transformer T152 which is tuned to 15 megacycles. Capacitor C185 is connected across the primary winding of T152 to achieve the specified bandwidth and selectivity requirements. A similar capacitor is connected across the primary winding of the coupling transformer in each of the succeeding stages for the same purpose. The secondary of T152 forms part of the return path for the grid of the succeeding tube V107; this path eventually returns to the AGC circuits. Resistor R129 and capacitors C191 and C194 constitute a decoupling circuit to prevent detuning of T152. The values of C191 and C194 are sufficiently small to minimize degeneration (lengthening) of AGC time constants.

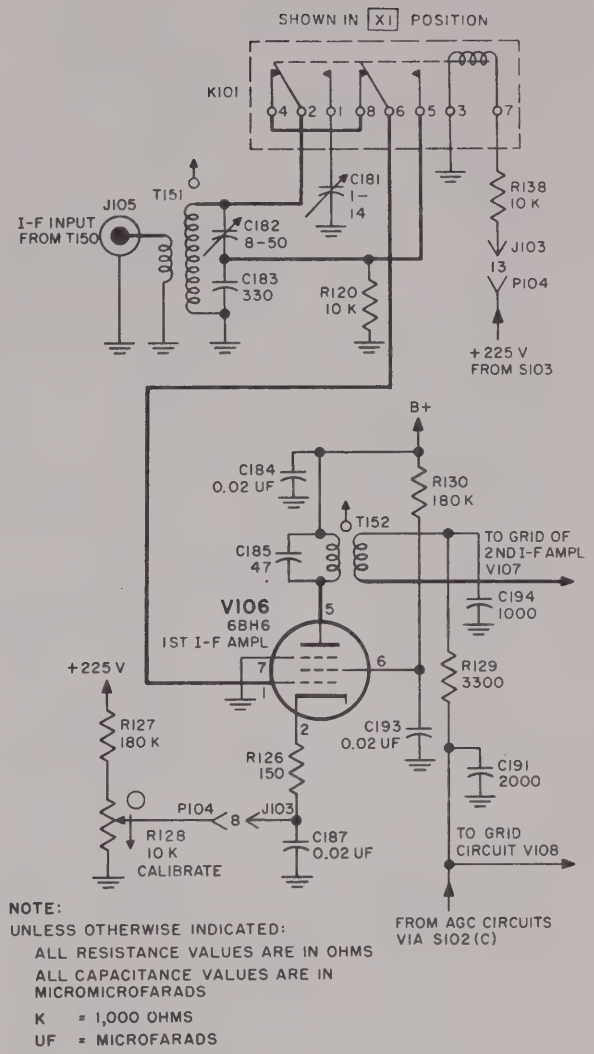


Figure 2-11. Input and First I-f Amplifier Stage, Simplified Schematic Diagram

(3) SECOND AND THIRD I-F AMPLIFIER STAGES. *(See figure 2–12.)*—The second and third i-f amplifiers V107 and V108 constitute AGC-controlled meter-scale tracking control stages. The circuits of both stages are functionally identical. Both circuits have unby-passed cathode resistors (R132 and R136, respectively). The grids of both tubes are supplied with AGC voltage through the secondary winding of the coupling transformer of the preceding stage. The operating bias for both tubes is controlled by the adjustment of the FI-10 potentiometer R137 which is used to establish correct meter scale tracking. A decoupling network composed of resistor R133 and capacitors C205 and C208 prevents detuning of transformer T153.

The output from the third i-f amplifier stage V108 is coupled via T154 directly to the grid of the succeeding stage (fourth i-f amplifier V109).

(4) FOURTH AND FIFTH I-F AMPLIFIER STAGES. *(See figure 2–13.)*—The fourth i-f stage V109

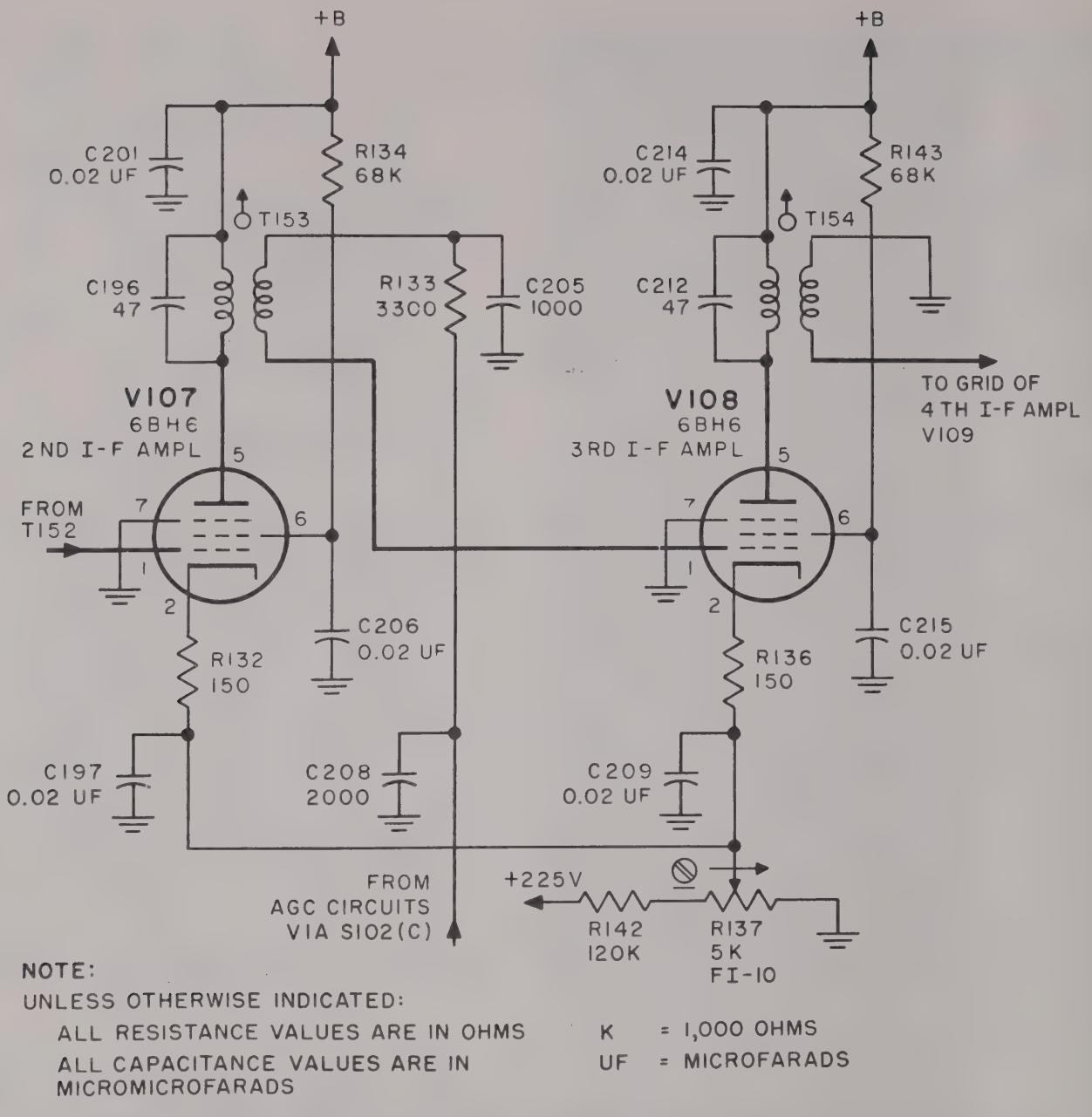
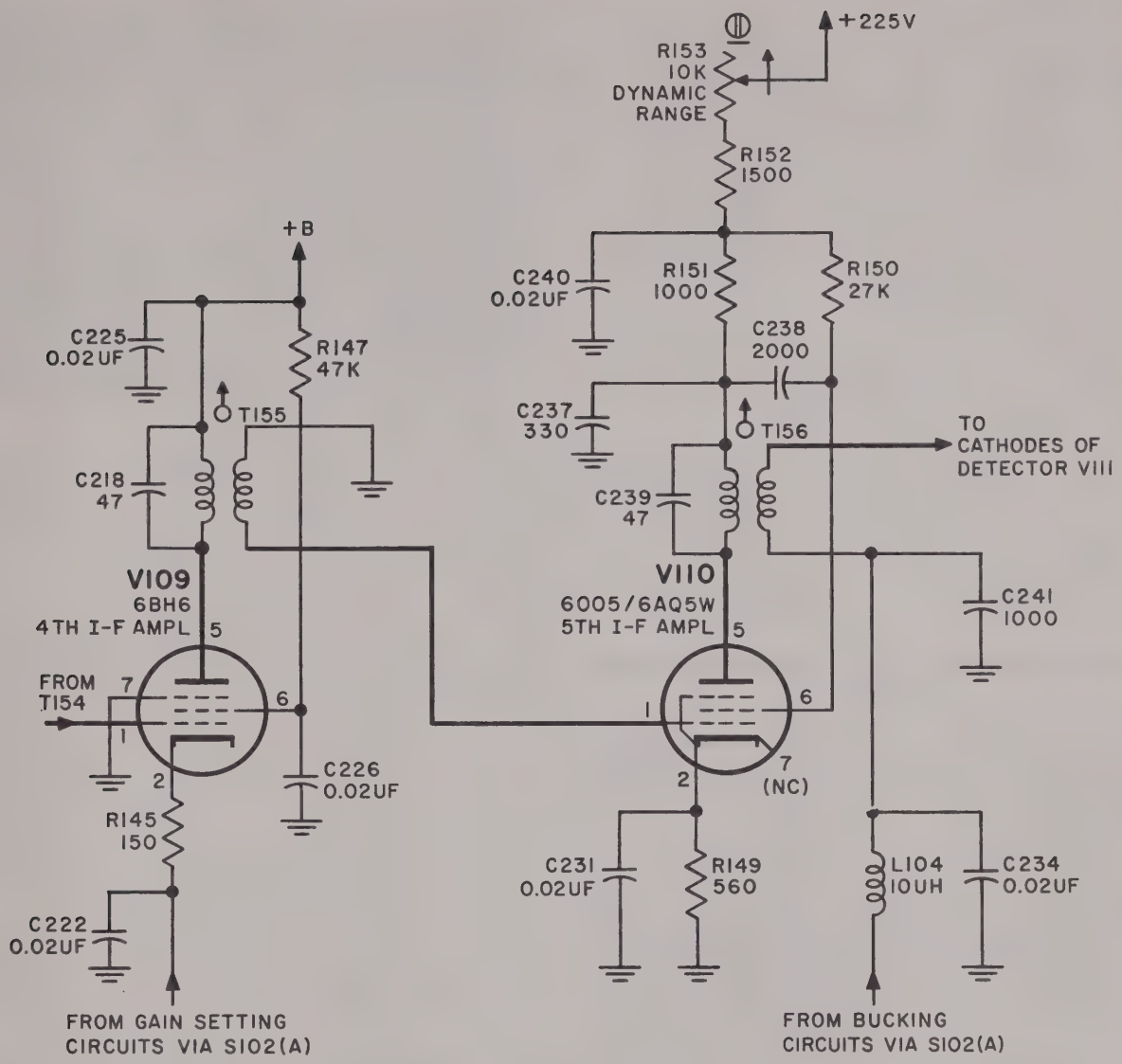


Figure 2-12. Second and Third I-f Amplifier Stages, Simplified Schematic Diagram

is an equalizing or gain-compensation stage. The input from the third stage V108 is applied directly to the grid of V109. (The grid circuit of V109 is returned to ground via transformer T154.) The bias of the cathode circuit of V109 can be changed by means of the function switch S102(A); appropriate values are inserted so that the gain of the stage can be adjusted to provide the same output level from detector tube V111 for quasi-peak field intensity and peak operation. The output of V109, taken from the plate, is coupled via T155 directly to the grid of the succeeding i-f stage V-110.

The fifth i-f stage V110 is a power driver stage employing a power amplifier pentode in a high-gain circuit with high dynamic range (overload capacity). Resistor R149 provides the cathode bias for this stage. Screen grid neutralization is obtained by a voltage tapped off the voltage divider formed by the primary winding of T156 and capacitor C237; this voltage is coupled to the screen grid through coupling capacitor C238. The dynamic range of the stage is controlled by the variable resistor R153 in the plate and screen circuits. The output of this stage is coupled via T156 to the cathodes of the detector stage V111.

(5) DETECTOR STAGE. *(See figure 2–14.)*—The diode detector V111 demodulates the i-f signal applied to its cathodes from T156. One of the diodes of V111 delivers its output from the plate (pin 7) to two branch circuits. One branch output is applied through r-f choke



NOTE:
UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS

K = 1,000 OHMS
UH = MICROHENRIES
UF = MICROFARADS

Figure 2-13. Fourth and Fifth I-f Amplifier Stages, Simplified Schematic Diagram

L106 to the pulse amplifier V115 (for the visual null indicator circuits) and the video amplifier V113 (and the following audio circuit). The second branch output from the plate (pin 7) is applied to the AGC and VTVM circuits in the FIELD INTENSITY, PEAK, CAL, and BFO positions of the function switch. Resistor R164 is the load resistor in this case. The other diode supplies an output from the plate (pin 2) to the AGC and VTVM circuits in the QUASI PEAK position of the function switch S102 only; the diode load resistor in this case is resistor R163.

(6) BFO STAGE. *(See figure 2–15.)*—The BFO stage V112 is provided for use in the detection of unmodulated (c-w) signals. It consists of a crystal-controlled oscillator operating at the intermediate frequency (15 mc) of the system. The impedance Z106, tuned to 15 megacycles, is in the plate supply line to increase the output signal. This oscillator is actuated only in the BFO position of the function switch S102. In this case the AGC circuits are not active, the meter circuit is disconnected, and the equipment operates at maximum gain. The output from V112 is mixed with the i-f signal from the fifth i-f amplifier stage merely by leakage within the shielded compartment containing BFO V112 and detector V111. BFO V112 is set into oscillation by the application of plate voltage via the

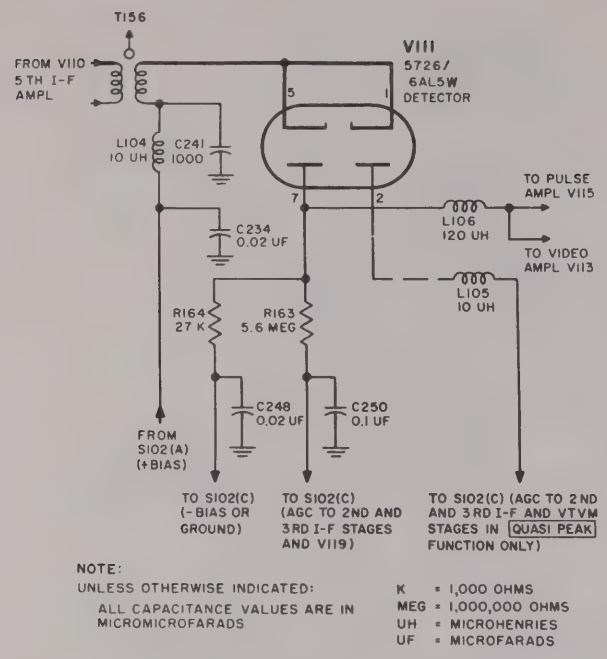


Figure 2-14. Detector Stage, Simplified Schematic Diagram

BFO position of the function switch S102(B). The BFO output signal frequency provides a convenient reference frequency for the alignment of the i-f transformers T151 through T156.

e. PULSE GENERATOR AND IMPULSE CALIBRATOR STAGE. *(See figure 2–16.)*—The pulse generator V121 and the impulse calibrator Z107 constitute a standard calibrating signal source contained within the equipment. The pulse generator V121 is essentially a free-running multivibrator operating at a low repetition rate (approximately 8 to 20 pulses per second). V121 is energized via S102(B) in the CAL position only. Capacitor C281 connected between the grid (pin 2) of V121 and the filament (pin 4) is used for the application of an initial disturbance to the grid to start action of the multivibrator. Pulse generator V121 drives the impulse calibrator Z107 by means of the coils of the latter which are connected in the cathode circuits of V121.

The impulse calibrator Z107 consists of a brass tube which contains an insulating sleeve. An iron slug with platinum contacts at either end moves axially between two mating platinum contacts within the insulating sleeve. The iron slug is actuated by the magnetic fields of two coils which are alternately energized by V121. The slug moves first by conduction of one half of V121 to the "charging" contact (energized from either +105 volts or −105 volts through R221). The slug becomes charged to that potential with respect to the grounded tubular shell. When the other half of V121 conducts, the slug is moved to the other end of its travel where it makes contact with a 10-ohm disc resistor through which the charge of the slug passes to ground. This creates a voltage pulse at the output terminal (connector) of Z107. This action is repeated for each cycle of operation of V121. The output pulses are delivered to J113 of switch S101 on the r-f attenuator assembly (via P106, cable W102, and P105) where they can be injected into the r-f stages. These pulses are of constant known amplitude and constitute the calibration signal for the equipment.

To prevent the transfer of metal at the platinum contacts, which would occur if the polarity of the charging voltage were constant, the polarity is reversed each time the pulse generator and impulse calibrator are energized (i.e., each time the function switch S102 is set to the CAL position). This action is accomplished by S102(E) which is ratchet driven by the function

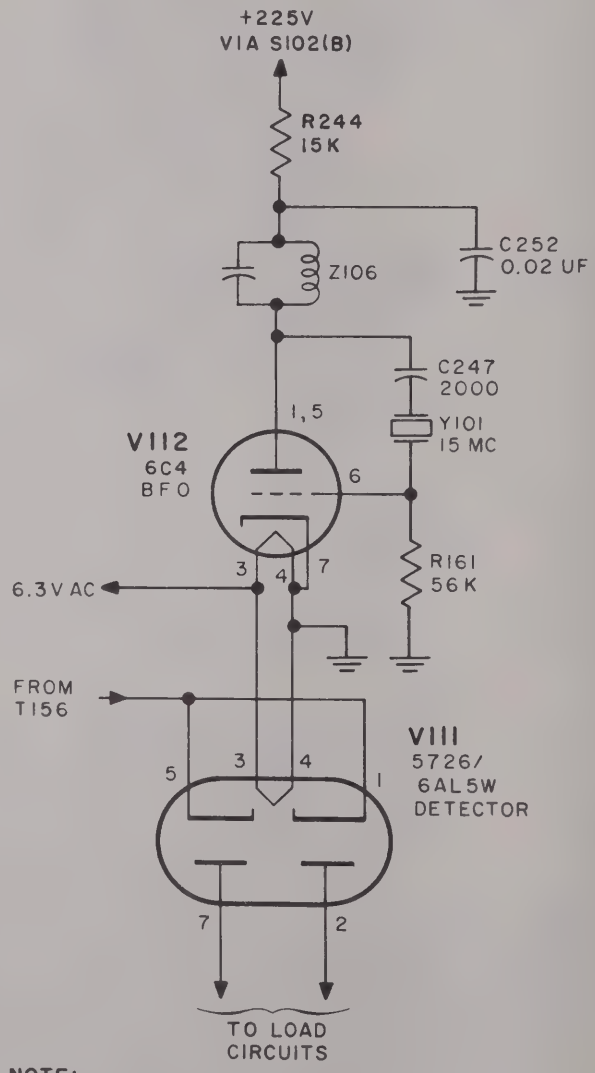


Figure 2-15. BFO (Beat Frequency Oscillator) Stage, Simplified Schematic Diagram

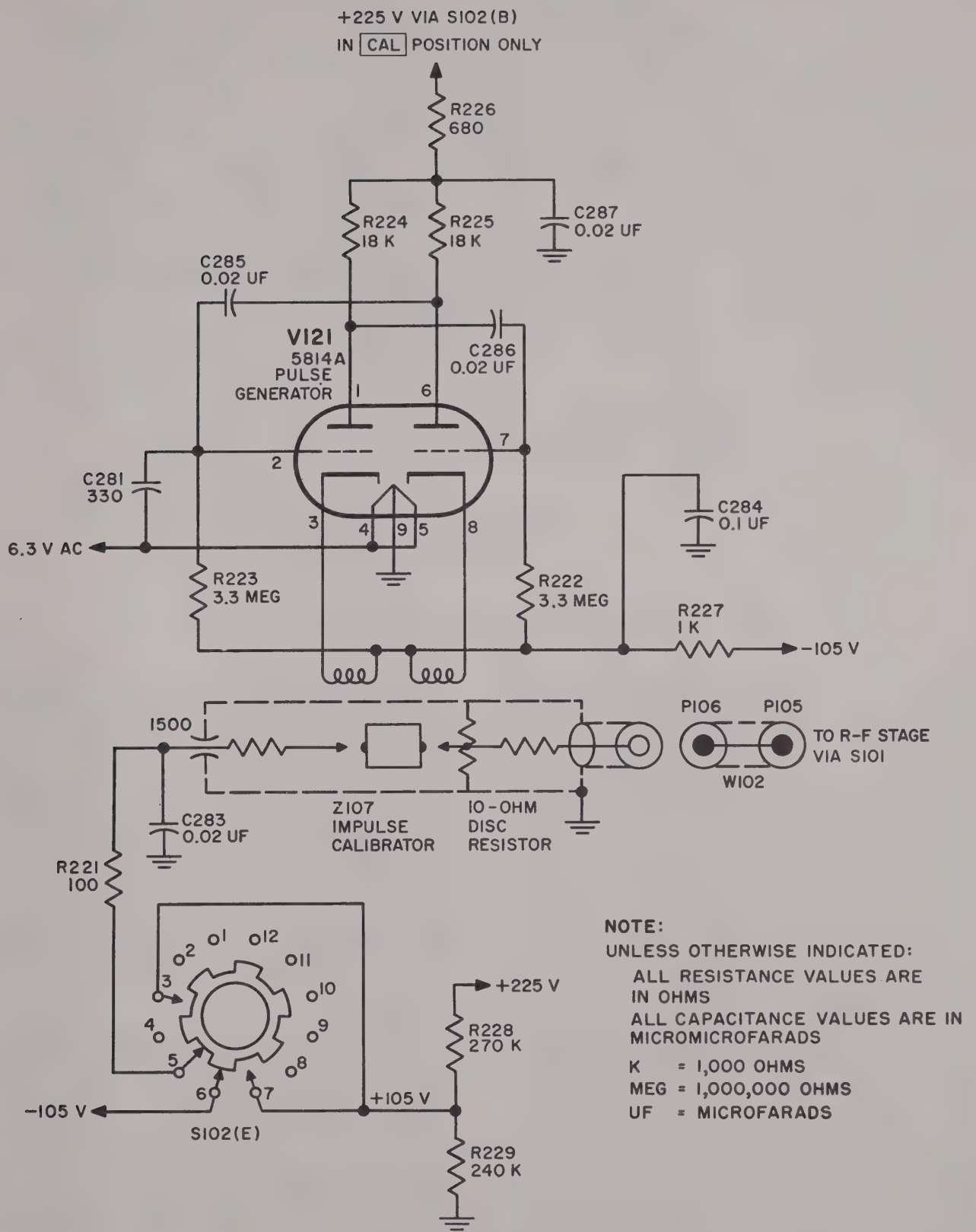


Figure 2-16. Impulse Generator and Calibrator Stage, Simplified Schematic Diagram

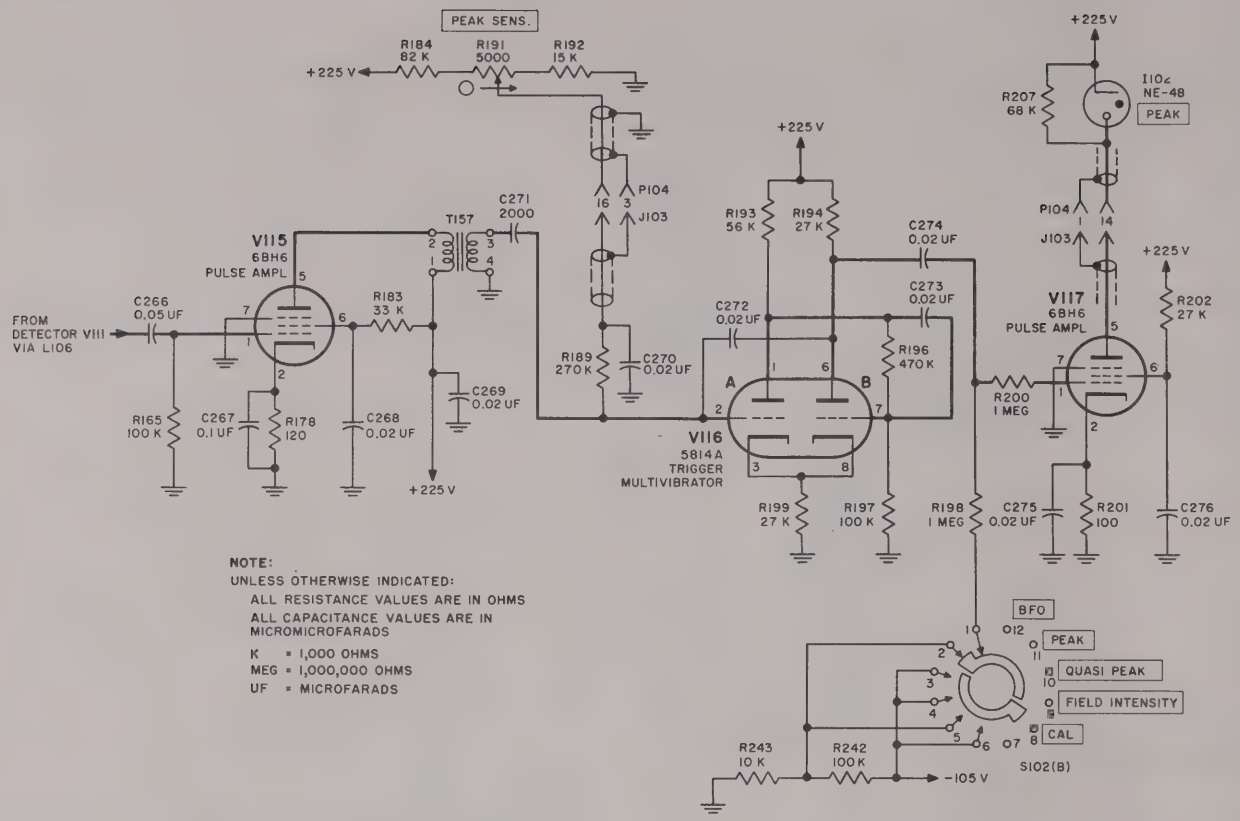


Figure 2-17. Pulse Amplifier and Visual Null Indicator Stages, Simplified Schematic Diagram

switch shaft. One position of the switch connects the wafer section to the −105-volt supply; the next position of the switch connects the wafer section to +105 volts derived from a voltage divider consisting of resistors R228 and R229 connected between +225 volts and ground. Subsequent positions of the switch connect the wafer section alternately to −105 volts and +105 volts.

f. PULSE AMPLIFIER AND VISUAL NULL INDICATOR STAGES. *(See figure 2−17.)*—The pulse amplifier V115 is energized from the plate (pin 7) of detector V111 via r-f choke L106 and capacitor C266. These signals can be either pulses or sine waves since they are derived from the same source as the video and audio signals used for oscilloscope and aural indication, respectively. The visual null indication however is provided primarily for use in peak value calibration where pulse signals are of interest. Accordingly, the pulse amplifier V115 and its circuits provide higher gain for pulse signals than for sine wave signals. The negative pulses arriving from the detector are amplified in V115 and the positive output pulses (taken from the plate) of V115 are coupled through T157 to the grid (pin 2) of V116A.

Tube V116 is connected as a one-shot multivibrator trigger circuit. With no negative signal applied to the grid (pin 2), and with the proper bias applied to that grid from the PEAK SENS. control R191, tube V116A is normally conducting (see table 7−3). The other half of the tube V116B, however, does not conduct by virtue of the negative bias on the grid (pin 7) (see table 7−3). This negative bias is derived from the voltage divider formed by resistors R193, R196, and R197 connected between +225 volts and ground. The arrival of a sharp negative pulse at the grid (pin 2) of V116A drives this section to cutoff (non-conduction) and V116B to conduction. This, at first, results in a decrease of potential in the plate circuit (pin 6) of V116B; then, as the circuit recovers, a positive potential, that is, a positive pulse of approximately 1/20-second duration, appears at pin 6 for each negative input pulse from V115. The output pulse is coupled to the succeeding pulse amplifier V117 via C274.

Pulse amplifier V117 is held at cutoff by a large negative bias (−105 volts) in the BFO, QUASI PEAK, and FIELD INTENSITY positions of the function switch S102(B). Visual null indication is not used in these positions. In the PEAK and CAL positions of S102(B), pulse amplifier V117 is provided with a suitable negative bias (approximately −10 volts) derived from the voltage divider formed by resistors R242 and R243 connected between −105 volts and ground. This negative bias prevents conduction of the tube until a positive pulse arrives from V116B. When the positive pulse from V116B is applied to the grid (pin 1) of V117, this tube conducts and allows current to flow through I102

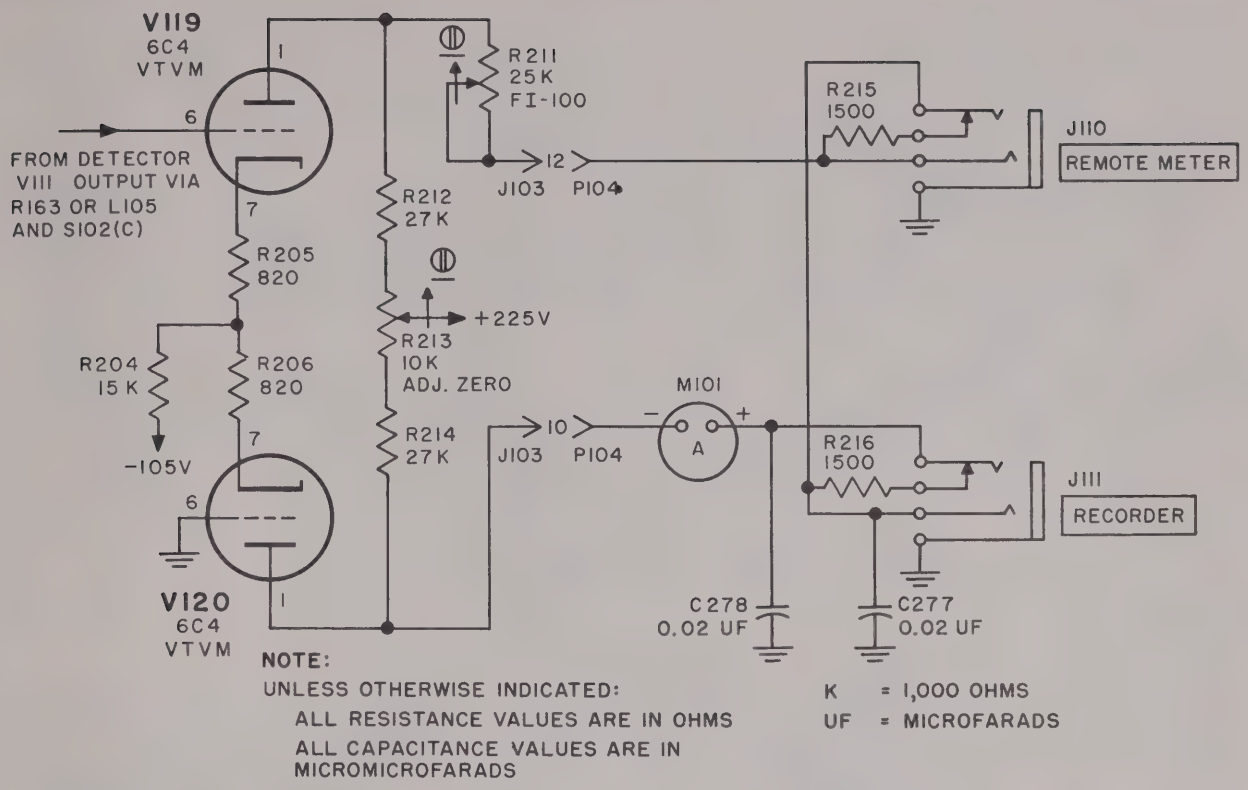


Figure 2-18. VTVM and Indicating Meter Stage, Simplified Schematic Diagram

for the duration of the pulse. The PEAK indicator lamp I102, therefore, flashes for each pulse output of V117.

The trigger circuit of V116 is self-excited or free-running if a prescribed amount of bias is applied to the grid (pin 2) of V116A. In operation, with no signal applied to pin 2 of V116A, the PEAK SENS. control R191 is adjusted to the point where V116 is free-running (i.e., where the PEAK indicator lamp I102 starts to glow continuously). The PEAK SENS. control R191 is then adjusted slightly in the opposite direction to the point where the PEAK indicator lamp I102 just ceases to glow. This is the threshold point where a slight increase in negative bias will cause V116 to trigger and produce one flash of I102 for each pulse input.

g. VTVM AND INDICATING METER STAGE. *(See figure 2–18.)*—The vacuum tube voltmeter circuit consists of a balanced bridge circuit in which tubes V119 and V120 form two adjacent arms. The d-c voltage to be measured (from either of the two detector output circuits) is applied to the grid of V119 which upsets the balance of the bridge, causing the indicating meter M101 to deflect up-scale and indicate the magnitude of the unbalance. The use of the balanced bridge circuit counteracts the effects of supply voltage variation since supply variations will affect both tubes equally and the resulting change in meter indication will be negligible.

The Adj. Zero control R213 is used to adjust the voltage applied to the plates of V119 and V120 for balancing of the bridge. Balance is indicated by a zero indication of meter M101with no signal input present. The FI-100 control R211 in series with meter M101 is a voltmeter sensitivity control for use in adjusting the meter full-scale deflection.

The REMOTE METER jack J110 and the RECORDER jack J111 provide connection facilities for a remote indicating meter and/or recording meter in series with meter M101. R-f pickup by cables connected to these jacks is filtered by capacitors C277 and C278.

h. VIDEO AND AUDIO AMPLIFIER STAGES. *(See figure 2–19.)*—The video amplifier V113 amplifies the output of detector V111 (pin 7) to make the modulation envelope of the input r-f signal available for oscilloscope observation. The modulation envelope signal from V111 is applied to the grid of video amplifier V113 via coupling capacitor C259. Video amplifier V113 has a wide-band response so that the modulation envelope frequency components up to 100 kilocycles are passed. Low-frequency response is increased by the use of capacitor C261 in the plate circuit and the unbypassed resistor R177 in the cathode circuit. The video output is taken from the plate of V113 and delivered to the OSCILLOSCOPE jack J107 via coupling capacitor C263. The combination of C263 and the load resistor R203 has a time constant sufficiently high to insure good low-frequency performance in the oscilloscope output.

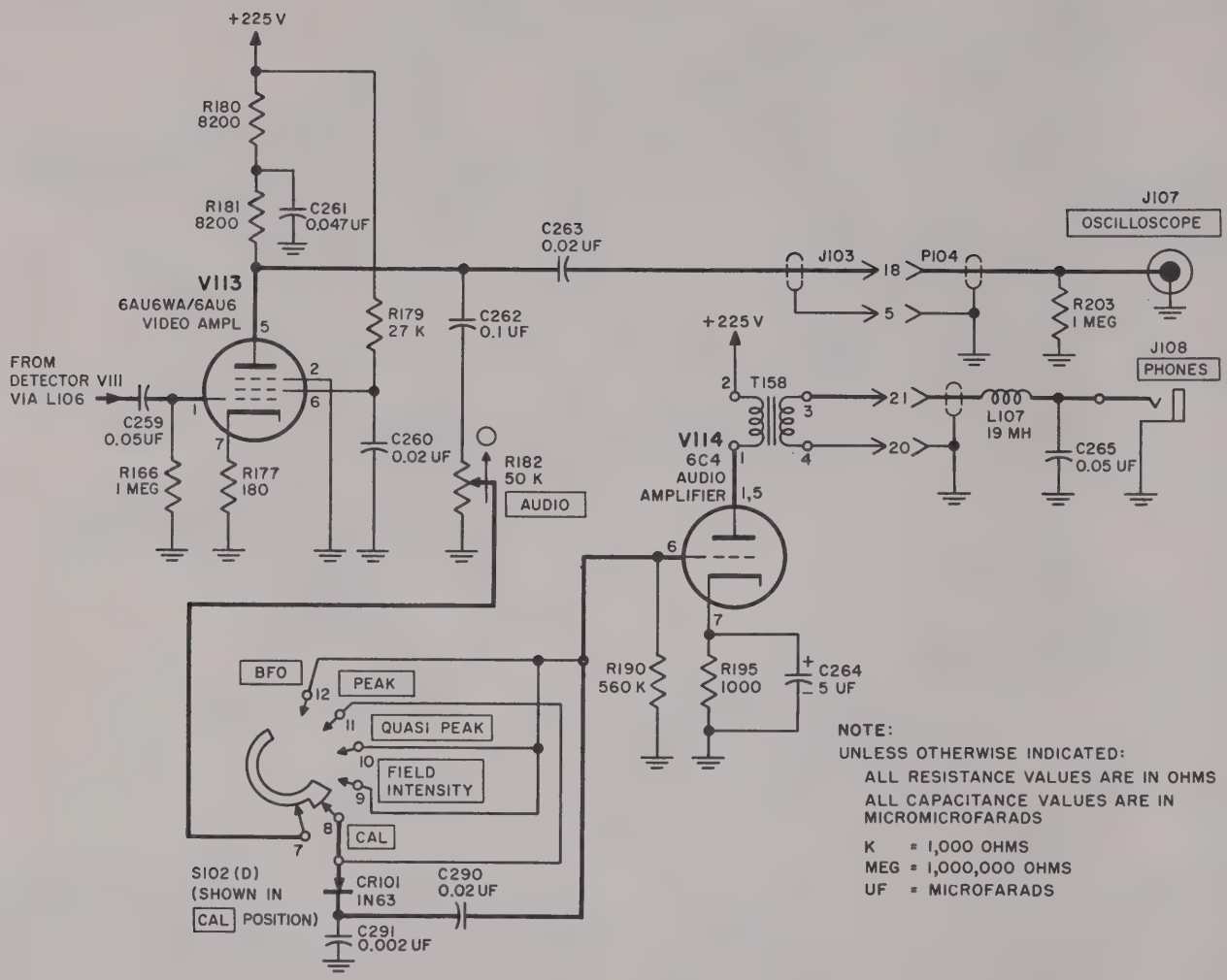


Figure 2-19. Video and Audio Amplifier Stages, Simplified Schematic Diagram

The audio signal is also taken from the plate of V113 and is coupled via C262 to the AUDIO control R182. From this point, the audio signal is applied through function switch S102(D) to the grid of audio amplifier V114. After amplification by V114, the audio signal is coupled by transformer T158 to the PHONES jack J108 for delivery to a headset. The audio output can be adjusted by means of the AUDIO control R182. R-f choke coil L107 and r-f bypass capacitor C265 form an r-f filter to prevent entry of r-f pickup from the headset cable (connected to J108).

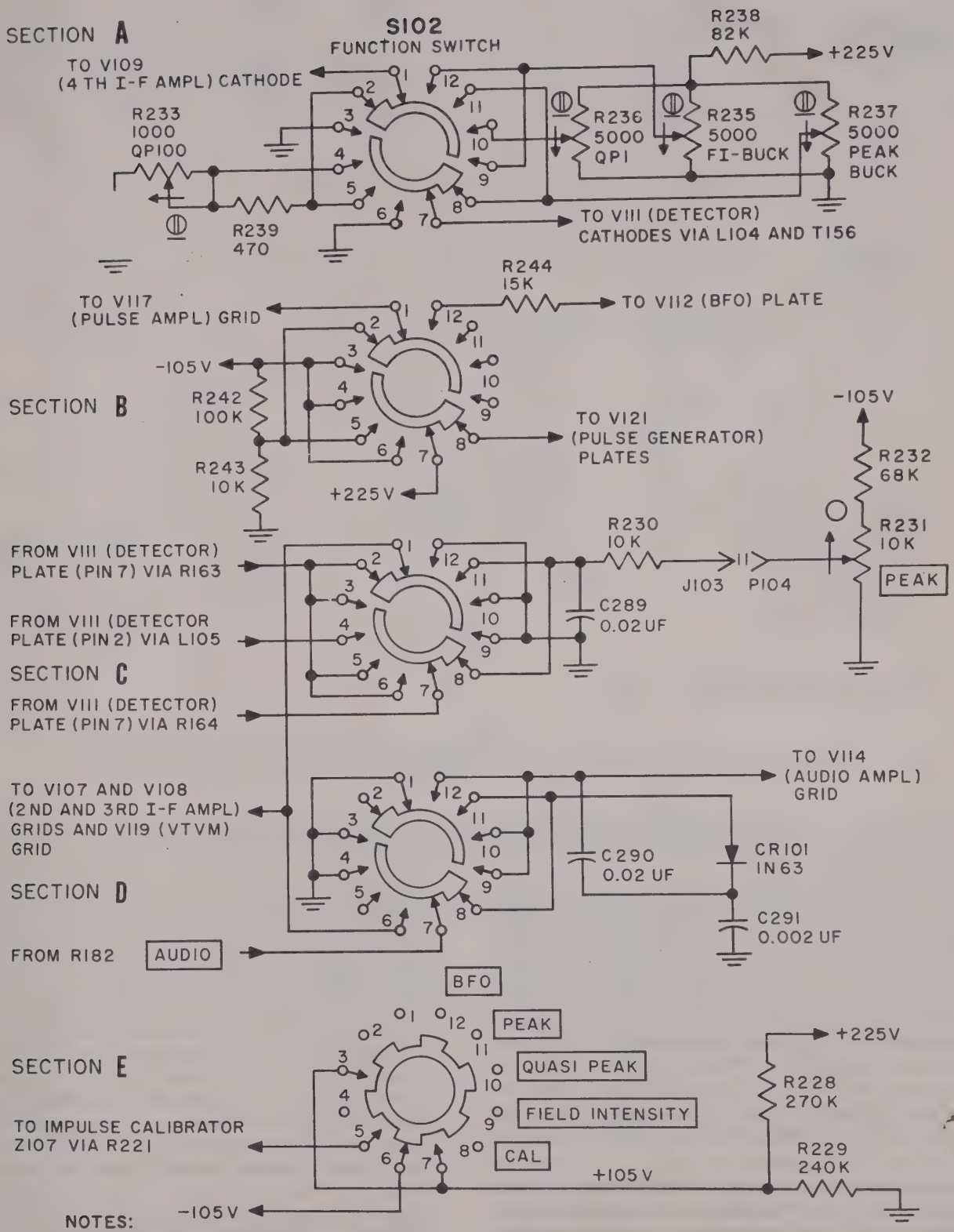
In some instances, the received input signal is a series of pulses so short in duration and/or with a repetition rate so low that the power output of the audio amplifier V114 is not sufficient to operate the headphones. Accordingly, a pulse stretcher circuit composed of CR101 and C291 is introduced in the grid circuit of V114 when the function switch S102(D) is in its PEAK or CAL position. The incoming positive pulse from video amplifier V113 passes through rectifier CR101 and charges C291. Because of the high resistance rectifier CR101 presents in the reverse direction, the charge of C291 leaks off slowly (with respect to the duration of the exciting pulse) through coupling capacitor C290 to the grid of audio amplifier V114. In this manner, the effective pulse length is increased and sufficient audio energy is produced to operate the headphones.

i. FUNCTION SWITCH, AGC, AND WEIGHTING CIRCUITS. *(See figures 2–20 through 2–25.)*—

Note

The term "weighting", as used in this text, refers to the time constant introduced in the detector and AGC circuits. This "weighting" effectivity determines the time versus voltage characteristics of the indication obtained.

(1) GENERAL.—The weighting circuits are selected by means of the function switch S102 and serve to weight the signal supplied to the indicating meter M101 properly for the three types of measurements performed by the equipment. These circuits and the performance features for each of the positions of the function switch S102 are discussed in the following subparagraphs. Simplified schematic diagrams are employed to illustrate



NOTES:
UNLESS OTHERWISE INDICATED:

1. ALL RESISTANCE VALUES ARE IN OHMS
   K = 1,000 OHMS UF = MICROFARADS
2. FUNCTION SWITCH S102 IS SHOWN AS VIEWED FROM THE REAR.

Figure 2-20. Function Switch S102, Simplified Schematic Diagram

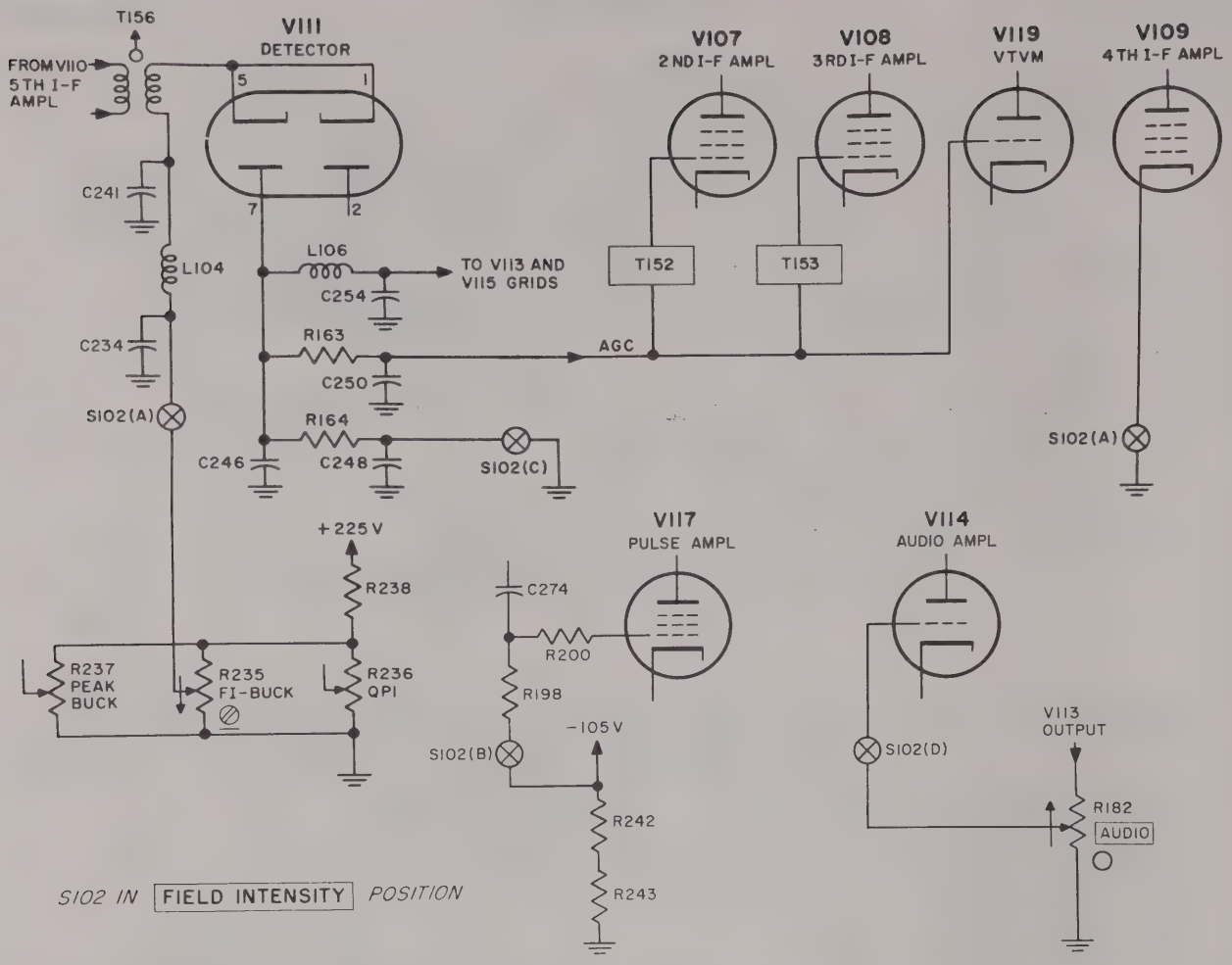


Figure 2-21. Function Switch in FIELD INTENSITY Position, Simplified Circuits

these circuits (figures 2–21 through 2–25). In addition, a simplified schematic of the function switch alone is shown in figure 2–20.

(2) FIELD INTENSITY POSITION. *(See figure 2–21.)*—In the FIELD INTENSITY position of function switch S102, only one half (pins 5 and 7) of detector V111 is used. Resistor R164 is the load resistor for this half of the detector V111. The video-audio signal is taken from the plate (pin 7) of V111 for application to pulse amplifier V115 (and the subsequent visual null indicator circuits) and to video amplifier V113 (and audio amplifier V114). Choke coil L106 and bypass capacitor C254 constitute an i-f filter which prevents appearance of an i-f signal component in the audio-video line.

A small self-induced voltage exists between the plate and cathode of V111. The effect is one of initial electron velocity in the diode caused by thermionic emission from the cathode. This voltage (diode self-bias potential) would also appear across load resistor R164 and in the VTVM and indicating meter circuit and would cause a small deflection on the indicating meter. To counteract this developed voltage, a small positive voltage, derived from variable resistor R235 FI-Buck, is applied through function switch S102(A) and the secondary of T156 to the cathode (pin 5) of V111. Variable resistor R235 FI-Buck is adjusted ideally to just cancel the self-bias potential of V111 (to just produce a zero reading on the indicating meter). Actually, the control is set to produce a very small deflection of the meter (approximately 1/16-inch deflection).

The detector output is also applied to the AGC circuit, R163 and C250, to produce the AGC signal which is applied to the grids of the second and third i-f amplifiers V107 and V108, respectively. The time constant of the AGC circuit, R163 and C250, is 600 milliseconds for charging and discharging. This relatively slow charge and discharge time filters out most of the modulation present in the detector output and produces a d-c signal whose magnitude is proportional to the average original carrier level. This same AGC (average carrier level) signal is also applied to the VTVM tube V119 to actuate indicating meter M101.

Switch S102(A) also connects the cathode of V109 (fourth i-f amplifier or gain compensating stage) to ground thereby removing additional cathode bias. Switch S102(B) applies a bias of –105 volts to the grid

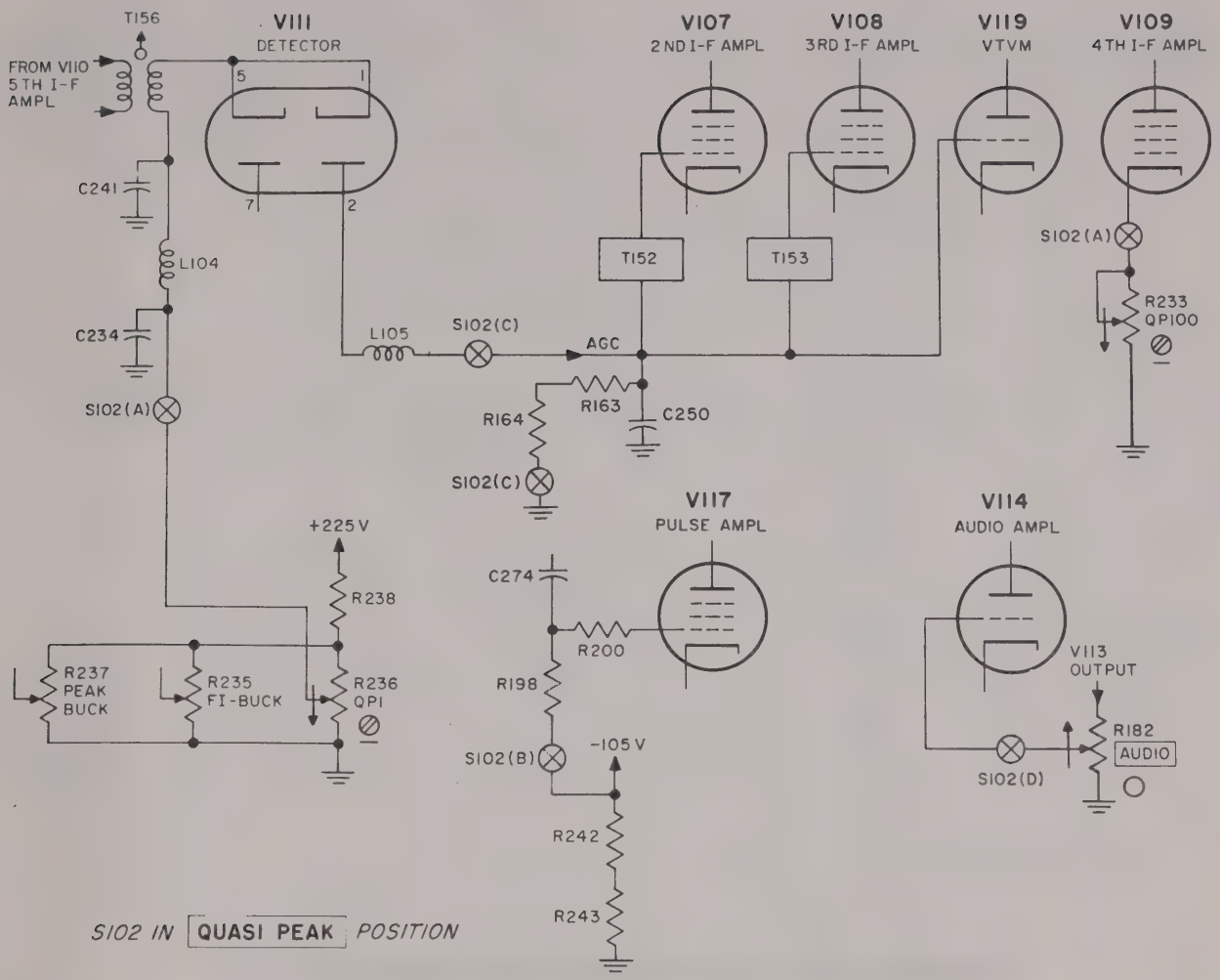


Figure 2-22. Function Switch in QUASI PEAK Position, Simplified Circuits

of pulse amplifier V117 to cut off this tube so that no visual indication can occur at PEAK indicator lamp I102. Switch S102(D) connects the output of AUDIO control R182 directly to the grid of audio amplifier V114. Since pulse signals are not being studied in this position of the function switch, the pulse-stretching circuit is not necessary.

(3) QUASI PEAK POSITION. *(See figure 2–22.)* —In the QUASI PEAK position of function switch S102, both sections of detector V111 are in use. The video-audio signal is taken from the cathode (pin 7), as in the FIELD INTENSITY position, and the operation of these circuits is discussed in the preceding subparagraph.

In the QUASI PEAK position of S102, resistors R163 and R164 serve as the load resistors for the output from detector diode (pins 1 and 2). Resistors R163, R164 and capacitor C250 constitute the weighting circuit. When detector V111 conducts, capacitor C250 charges up rapidly (one millisecond); when V111 ceases to conduct, capacitor C250 discharges slowly through R163 and R164, resulting in a long discharge time (600 milliseconds). Therefore, in the case of a received signal containing pulses occurring in rapid succession, the average voltage appearing across R163 and R164 will be near the peak value of the pulses. This voltage appearing across R163 and R164 is used as the AGC (and quasi-peak value) signal which is applied to the grids of the second and third i-f amplifier stages V107 and V108, and to the VTVM tube V119 to actuate indicating meter M101.

Because of this different mode of operation (different weighting circuit) and the requirement that, for an unmodulated r-f signal, the output indications be the same for both FIELD INTENSITY and QUASI PEAK operation, it is necessary that additional bias be applied to the fourth i-f amplifier stage V109. This is accomplished by means of adjustable resistor R233, QP 100, in the cathode circuit of V109 via S102(A).

The efficiency of detector V111 is different in QUASI PEAK operation from that in FIELD INTENSITY operation because of the difference in load resistors and,

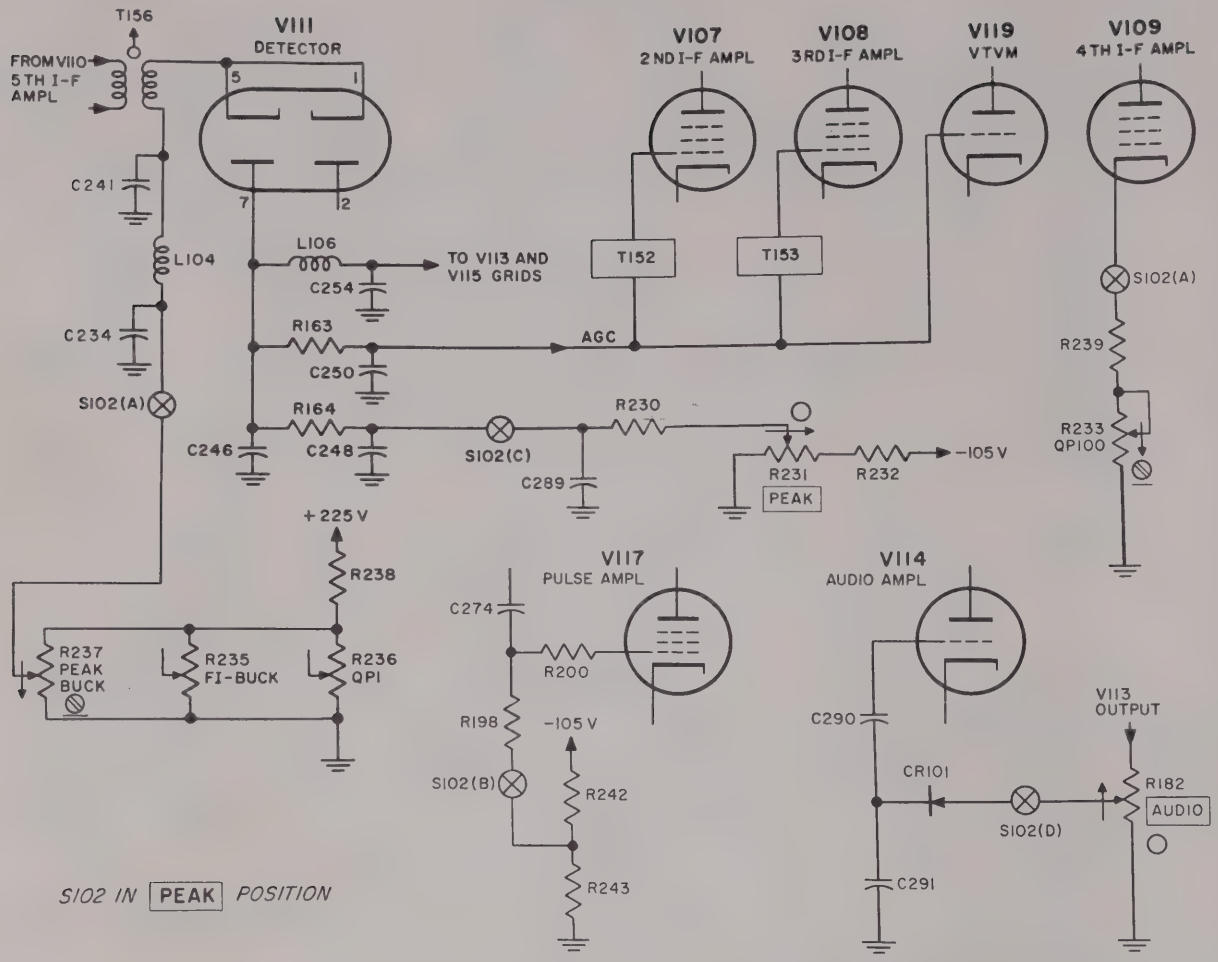


Figure 2-23. Function Switch in PEAK Position, Simplified Circuits

therefore, a different self-bias potential will be developed. Accordingly, a different positive bias is applied to the cathodes of V111 from R236, QP1, via S102(A).

As in FIELD INTENSITY operation, pulse amplifier V117 is held cut off by S102(B) and audio amplifier V114 is operated without the pulse-stretcher network by S102(D).

(4) PEAK POSITION. *(See figure 2—23.)*—In the PEAK position of the function switch S102, the peak values of pulse signals are to be measured. In this case, one diode (pins 5 and 7) of detector V111 is used. Resistor R164 is the load resistor for the diode. Resistor R164, however, is no longer connected to ground as in the FIELD INTENSITY case, but is connected through S102(C) and a filter network (composed of capacitor C289 and resistor R230) to an adjustable negative bias control R231 PEAK. This provides the standard "slide-back" measurement facility for the determination of peak values.

Function switch S102(A) permits application of a positive bias from variable resistor R237 Peak Buck to the detector V111. This is done to equalize the indicating meter reading for low signal levels (modulation of high repetition rate i.e., 1000 volts) in the PEAK position with that obtained in the QUASI PEAK position of function switch S102. S102(A) also introduces an additional bias resistor in the cathode circuit of the fourth i-f amplifier V109 to modify the gain of this stage in accordance with the PEAK operation.

Switch S102(C) connects the AGC circuit, R163 and C250, to the grids of the second and third i-f amplifiers and to the VTVM stage. S102(B) removes the cutoff bias from pulse amplifier V117 and applies the appropriate operating bias for this tube so that pulse signal indications can be observed. Since the PEAK function of this equipment is employed with pulse signals, the pulse stretcher circuit, CR101 and C291, is inserted in the input circuit of audio amplifier V114 by switch S102(D).

In operation, the slide-back PEAK control R231 is first set to produce the maximum negative bias; the control is then adjusted in the reverse direction until the PEAK indicator lamp I102 just starts to flash or until the signal is just heard in the headphones. At this point, the signals applied to detector V111 are just beginning to overcome the bias supplied by R231. This bias volt-

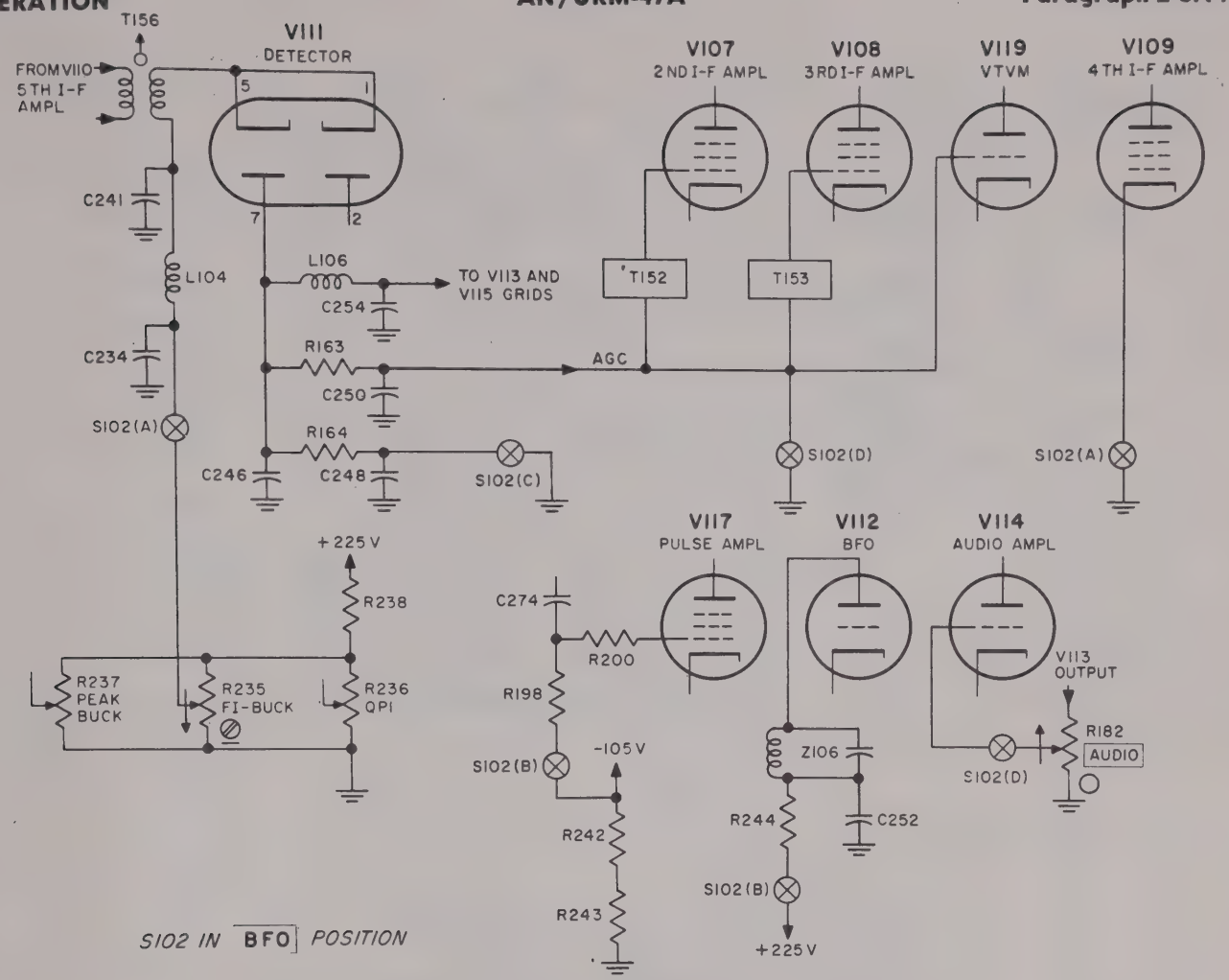


Figure 2-24. Function Switch in BFO Position, Simplified Circuits

age is then the measurement of the peak values and is effective at the plate (pin 7) of V111, the AGC bias circuit, and the signal supplied to the VTVM tube V119. For this latter reason, the reading on indicating meter M101 is the measurement of the peak values.

(5) BFO POSITION. *(See figure 2–24.)*—In the BFO position of the function switch S102, the circuit connections are the same as for the FIELD INTENSITY position except as indicated in the following.

The AGC circuit is grounded through S102(D). This causes the second and third i-f amplifier stages V107 and V108 to operate at maximum gain. The VTVM tube V119 is disabled to protect the indicating meter M101 from being driven off scale. The fourth i-f amplifier V109 is also permitted to operate at maximum gain since its cathode is connected to ground via S102(A). S102(B) allows the application of the +225-volt B+ supply to the plate of the BFO tube V112 for operation.

(6) CAL POSITION. *(See figure 2–25.)*—The CAL position of the function switch S102 provides the same circuit connections as in the PEAK position. This is done because the calibration of the equipment is accomplished by means of pulse signals from the impulse calibrator Z107. In addition to the PEAK position connections, the following connections are made.

Function switch S102(B) provides for the application of +225 volts to the plates of the pulse generator V121 so that the tube operates and actuates the impulse calibrator Z107.

Function switch S102(E) permits the application of either +105 volts or −105 volts to the impulse calibrator Z107 (see subparagraph 2–3*e*).

2-4. DETAILED THEORY OF OPERATION, POWER SUPPLY PP-906A/URM-47.

(See figure 2–26.)

Power Supply PP-906A/URM-47 is designed to operate from a single-phase source, 105 to 125 volts, and 50 to 60 cycles or 400 cps. The power supply provides regulated plate power of +225 volts at 134 milliamperes, a regulated bias supply of −105 volts at eleven milliamperes, and filament power of 6.3 volts ac at 4.25 amperes.

Power Supply PP-906A/URM-47 provides the correct operating voltages for the AN/URM-47A RI-FI Meter.

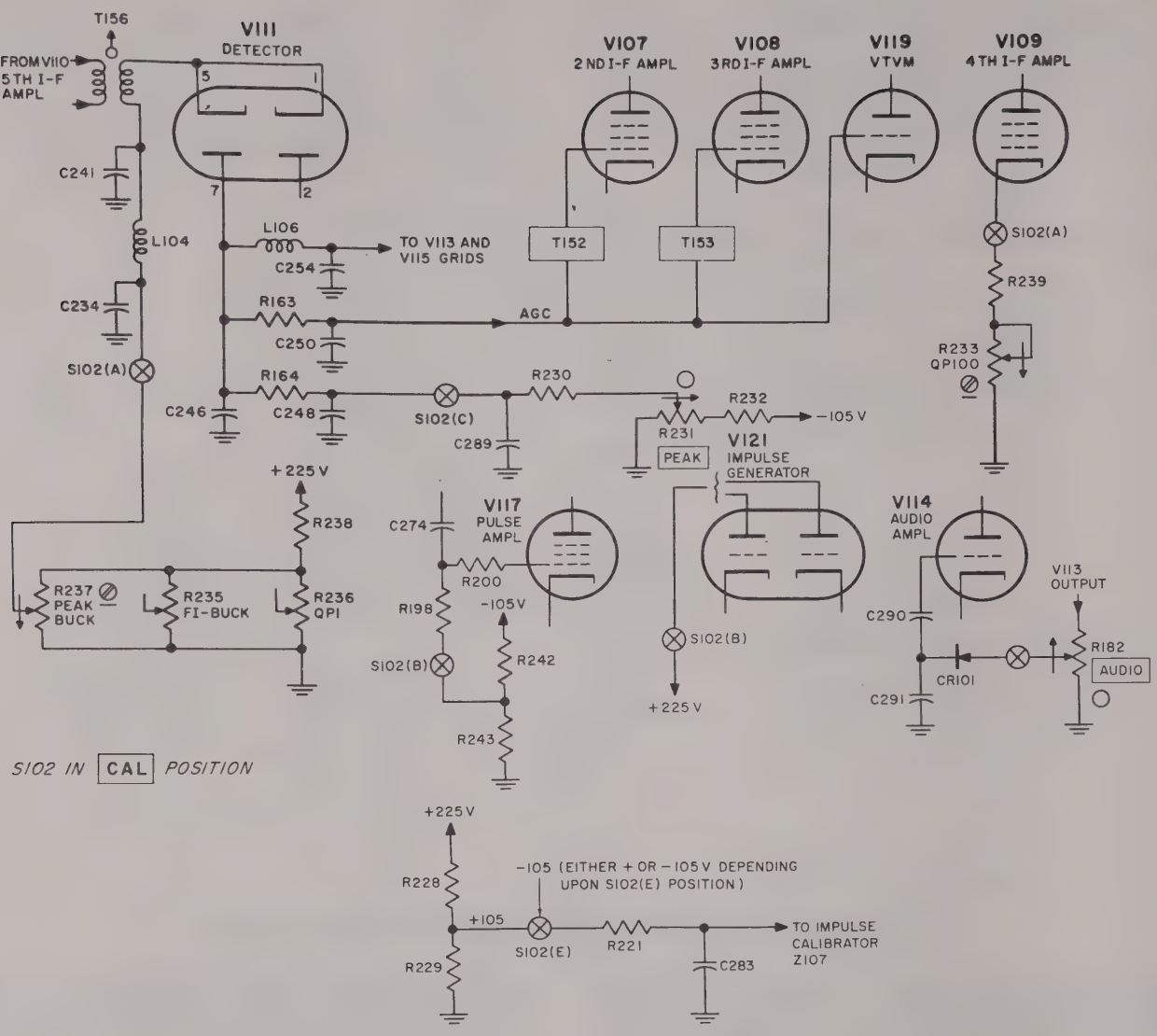


Figure 2-25. Function Switch in CAL Position, Simplified Circuits

Regulation is accomplished by an electromagnet servo system which adjusts the voltage applied to the primary of the power transformer to correct for voltages in the rectified output of the supply due to changes in the input voltage or varying load.

The POWER switch S301 applies the primary power from POWER INPUT receptacle J302 to the line filter Z301. Fuse protection is provided by F301 and F302. Filter Z301 and isolation transformer T302 prevent interference from entering the power supply and RI-FI Meter circuits and being recorded as interference, or from leaving the power supply and feeding back into the line.

A dpdt toggle switch S302, located on the chassis, provides for operation from a nominal 115-volt or 230-volt power source by connecting the two primary windings of isolation transformer T302 in parallel or in series respectively.

A RECORDER CHART DRIVE receptacle J303 taps from the filtered line supply (terminals 3 and 4 of T302) to operate a recorder (for example, Milliammeter Recorder RD-59/U), if employed. The receptacle J303 provides 115 volts for operation of an a-c recorder drive motor.

CAUTION

Use the RECORDER CHART DRIVE output on 60-cycle input power only. The voltage at this receptacle is always 115 volts irrespective of the position of S302 for 115-volt or 230-volt operation.

The input power, obtained from the secondary winding (terminals 5 and 6 of T302) of the transformer is connected as follows: One side of the secondary wind-

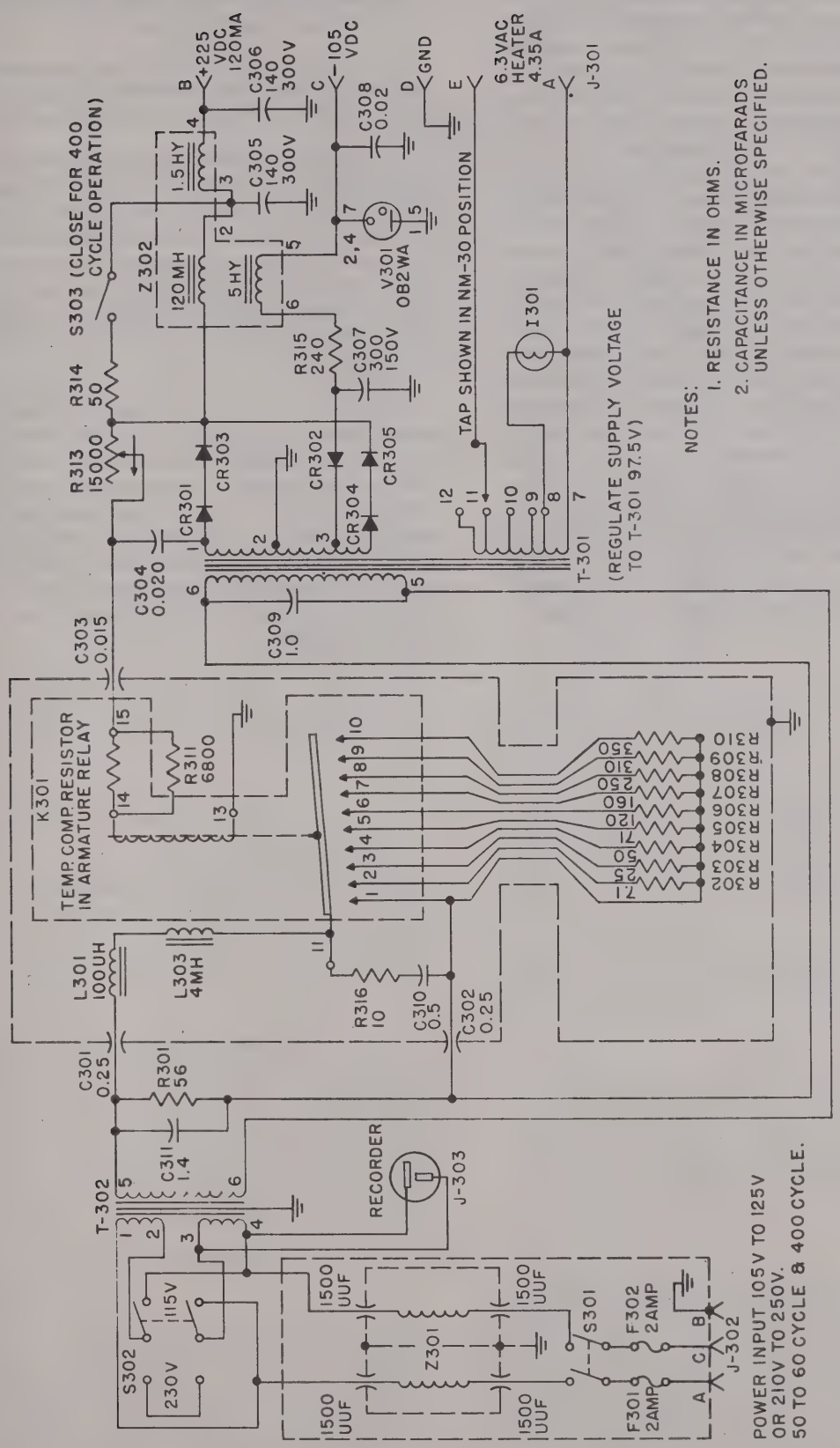


Figure 2-26. Power Supply PP-906A/URM-47, Complete Schematic Diagram

ing of isolation transformer T302 is connected directly to one side of the primary of power transformer T301. The other side of the secondary winding of T302 is connected to the other side of T301 primary winding through a parallel resistance network consisting of R301 and an electromagnetic voltage regulator. The voltage regulator functions as a magnetically operated rheostat in the primary of the transformer T301. Its function is accomplished in the following manner:

The voltage regulator in the primary of T301 inserts varying values of resistance in parallel with R301 to compensate for changes in line voltage. The resistors R302 through R310 constitute the resistors which are parallel across R301 by the shunting action of armature (11) across the contacts 1 through 10. The armature position is controlled by the current through a solenoid (terminals 13 and 14 of K301). The solenoid forms a part of a series circuit between the rectified output of transformer T301 and ground. The current through the solenoid is therefore a function of the rectified output voltage. An increase in the line voltage causes an increase in the rectified output and therefore and increase in current through the solenoid. The solenoid then positions the armature to insert more resistance in series with T301 primary. The increased line resistance causes the rectified output to decrease to the desired value.

Extensive filtering is provided against contact noise by the use of filter chokes L301, L303, capacitors C301, C302, C310 and resistor R316.

The correct operating point for the system to obtain +225 volts output is established by the potentiometer R313, in series with the control solenoid K301.

The OUTPUT POWER obtained from the secondary winding (terminals 1 and 4) of T301 is full-wave rectified by the four silicon rectifiers CR301, CR303, CR304, and CR305. The filter assembly Z302 and the filter capacitors C305 and C306 provide a filtered output of +225 volts at pin B of J301. When the equipment is operated from a 400-cycle source, S303 inserts R314 across Z302 to modify the filter constants for 400-cps line operation.

The −105-volt d-c bias voltage is obtained from terminals 2 and 3 of POWER TRANSFORMER T301 and half-wave rectification through silicon rectifier CR302. This rectified voltage is filtered by C307 and C308. Gaseous regulator tube V301 regulates the output voltage at pin C of P301 to −105 volts. Filament power for the RI-FI Meter is made available at pins A and E of J301 from terminals 7 and 12 on T301. The power supply ON indicator (I301) is lighted when the primary power is applied.

SECTION 3

INSTALLATION

3-1. SCOPE OF THIS SECTION.

Radio Interference Measuring Set AN/URM-47A is portable equipment and no provisions are made for permanent mounting. Procedures for setting up the equipment for operation are given in this section; actual operating procedures are given in Section 4.

3-2. UNPACKING THE EQUIPMENT.

(See figure 3—1.)

Unpack the equipment as directed in figure 3—1. Do not tear the waterproof barriers; open them carefully so that they can be used again. For the same reason, use a nail-puller or other suitable tool for removing nails in the shipping case cover so that the cover is not damaged. Upon removing the equipment from the shipping case, it is advisable to put the cellulose wadding and waterproof barriers back in the shipping case and retain the case for possible repacking and reshipping.

3-3. DIMENSIONAL DATA.

(See figures 3—2 through 3—5.)

Dimensional data given in the referenced illustrations can be used for estimating space requirements in the variety of operating locations afforded by Radio Interference Measuring Set AN/URM-47A. These data are also useful in planning storage or transportation facilities for the equipment.

3-4. POWER SUPPLY REQUIREMENTS.

In general, the RI-FI Meter will be operated with an external power source connected to Power Supply PP-906A/URM-47. The external power source must be rated at 105-125 or 210-250 volts ac, single phase, within frequency range of 50-60 or 400 cps. Power consumption of the equipment is 115 watts at 115 volts, 60 cps.

3-5. INITIAL EQUIPMENT SET-UP.

(See figure 3—6.)

a. GENERAL.—Radio Interference Measuring Set AN/URM-47 is radio interference and field intensity survey equipment suitable for operation in various situations. Instructions for setting up the equipment are given in paragraph 3-5.*b,* following; the optional use of accessories from other related test sets is given in paragraph 3-5.*c.*

b. REGULAR SET-UP.

Step 1. Open Test Set Case CY-1527/URM-47 and lift out the RI-FI Meter. Place the unit on a convenient bench or other flat surface with the front panel in a vertical plane. Remove the protective cover for access to the front panel. Remove Chart Set PT-188/URM-47 from the protective cover for reference during operation.

Step 2. Lift Power Supply PP-906A/URM-47 out of Accessories Case CY-1525/URM-47 and place on the bench or flat surface. Remove the protective cover from the unit.

Step 3. Open the strap fasteners securing the cables in the accessory case.

Step 4. Remove the Power Cable Assembly 91487-1 (10′ 0″) and connect between the POWER OUTPUT receptacle (J301) on the power supply and the POWER receptacle (J106) on the RI-FI Meter.

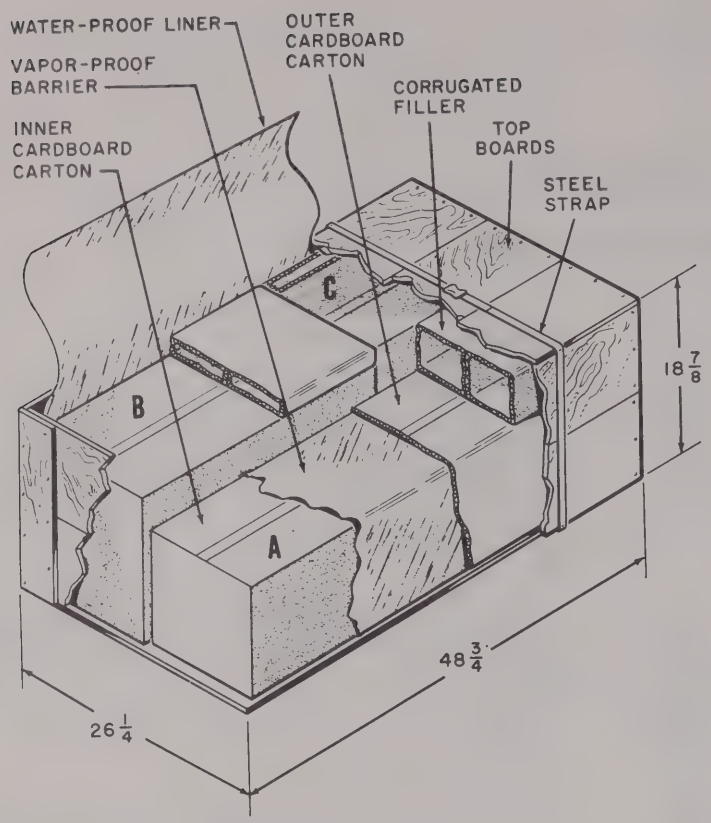
Step 5. Remove the a-c Power Cable Assembly CX-3810/U (6′6″) and connect to the POWER INPUT receptacle (J302) on the power supply. Do not connect the other end of cable to the external power source at this time. See subparagraph *d,* following.

Step 6. Remove the r-f transmission line Cable Assembly CG-92D/U (20′ 0″) and connect one end to the RF INPUT receptacle (J101) on the RI-FI Meter.

Note

In all types of measurements, Cable Assembly CG-92D/U (20′0″) must be connected between the RF INPUT receptacle and the antenna or probe. The Right-Angle Adapter UG-27B/U may or may not be used as desired for convenience.

Step 7. Connect the r-f probe cable, Radio Frequency Cable Assembly CG-1064/U (1′ 6″) to Cable Assembly CG-92D/U (20′ 0″) and the load (use the end with the alligator clips) to make conducted interference measurements on power lines up to 1000 volts ac or dc. The measurement in this case is made from each side of the line to ground and *not* across the line. The black clip (shielded wire lead) must go to ground. When making conducted measurements remove any other



UNPACKING INSTRUCTIONS

1. SNIP STEEL STRAPS
2. REMOVE TOP BOARDS
3. OPEN WATER-PROOF LINER
4. REMOVE CORRUGATED FILLER
5. OPEN OUTER CARDBOARD CARTON
6. OPEN VAPOR-PROOF BARRIER
7. OPEN INNER CARDBOARD CARTON TO EXPOSE HANDLES ON CASES

ALL DIMENSIONS ARE IN INCHES

A ANTENNA CASE CY-1526/URM-47
B TEST SET CASE CY-1527/URM-47
C ACCESSORIES CASE CY-1525/URM-47

Figure 3-1. Radio Interference Measuring Set AN/URM-47A, Unpacking Procedure

equipment ground connection to eliminate a "ground loop".

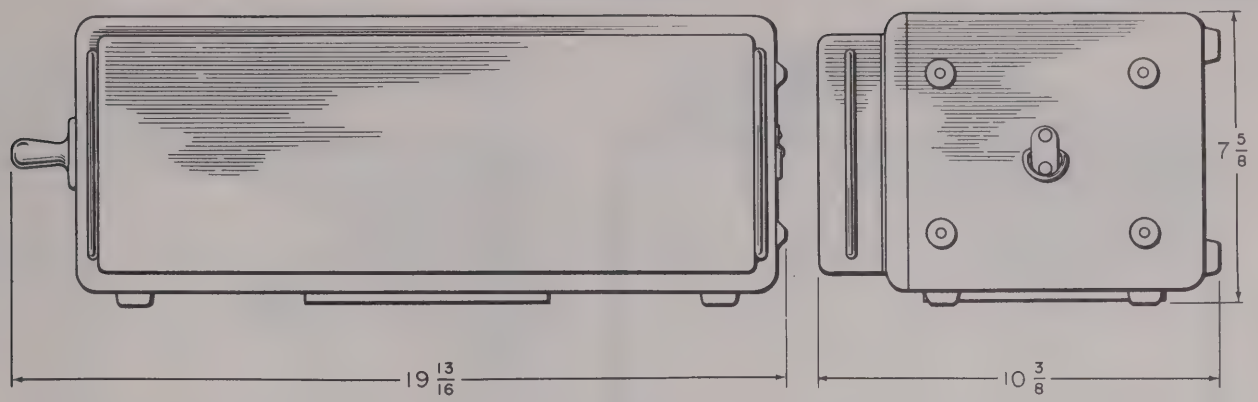
Step 8. Open Antenna Case CY-1526/URM-47 and assemble Mast Section AB-363/U and Tripod CAC 10545 for measurements using a dipole antenna. Loosen the upper knob on each leg, spread the legs as needed for adequate stability, and tighten the lock knobs. The extension portion of the tripod legs is removable, with one end fitted with a rubber foot for use on hard surfaces and the other end with a steel spike for use on soft surfaces. After loosening the lower lock knob on each leg, the extension portion can be lengthened or shortened as desired. Make sure the azimuth pointer assembly is secured to one of the mast sections.

Step 9. The azimuth dial assembly is inverted on the tripod head for stowing so that the sighting pins on the dial will be protected. Loosen the lock screw on the azimuth dial and slide it off the sleeve on the tripod head. Then, with the azimuth dial facing up, slip the assembly in place on the tripod head. The azimuth dial must be oriented to magnetic north before being locked to the tripod head.

Step 10. Remove either dipole antenna and all the antenna elements (seven pairs). Refer to Chart No. 3, figure 4—4, for the required antenna elements for the desired frequency. Attach the antenna elements to the dipole and connect Cable Assembly CG-92D/U (20′ 0″) (with or without the right-angle adapter) to the antenna dipole. Mount the antenna dipole at the top of the antenna mast section. Place the mast section temporarily into the azimuth dial assembly until the azimuth dial has been oriented with magnetic north. (The antenna mast section may or may not be used, as desired.)

Step 11. If it is desired to use the loop antenna, Antenna AT-426/U, it can be hand-held or mounted on the tripod (with or without the antenna mast section). If it is to be hand-held, connect the r-f transmission line, Cable Assembly CG-92D/U (20′ 0″) directly to the loop antenna or through Antenna Base AB-374/URM-47 to the loop antenna. Antenna Base AB-374/URM-47 can be attached to the loop antenna by removing a knurled bayonet-fastened adapter from the loop and attaching the antenna base. The antenna base can be mounted on the tripod, if desired, with or without the mast section.

Step 12. The ground plane vertical Antenna Base AB-364/U is used without the tripod or mast section and is placed directly on the ground. Twenty-six copper wires for this antenna base need only be used when the soil is dry. The antenna elements are attached to the base and extend vertically upwards. Connect the r-f transmission line, Cable Assembly CG-92D/U (20′ 0″), to the antenna base.



NOTE: ALL DIMENSIONS ARE INCHES

Figure 3-2. Radio Interference-Field Intensity Meter IM-88/URM-47, Outline Drawing

c. OPTIONAL SET-UP.—Certain accessories supplied with related equipment can be used with Radio Interference Measuring Set AN/URM-47A to facilitate field operations as follows:

ACCESSORY	PARENT TEST SET	OPTIONAL USE
Observer Compass Mark 1 Mod 0	AN/URM-6	Orient dipole antenna to magnetic north.
Special Purpose Cable Assembly CG-572/U (20′ 0″)	AN/URM-6 AN/PRM-1	Headphone extension cable.
*Ammeter ME-31/U	AN/URM-6	Remote meter indication at dipole antenna location.
Special Purpose Cable Assembly CG-571/U (20′ 0″)	AN/URM-6 AN/PRM-1	Cable to remote meter.
**Milliammeter-Recorder RD-59/U	AN/URM-6	Make graphic recordings.
Special Purpose Cable Assembly CG-571/U (6′ 0″)	AN/URM-6	Cable to milliammeter-recorder.
Tripod MT-674/U	AN/URM-6	To mount the RI-FI Meter on a tripod.

*Not precisely identical to indicating meter in Radio Interference-Field Intensity Meter IM-88/URM-47.

**Calibrated rule supplied with this unit is not suitable for Radio Interference-Field Intensity Meter IM-88/URM-47.

The use of these units is described briefly here: A mounting plate is fitted to the bottom of Radio Interference-Field Intensity Meter IM-88/URM-47 similar to that on the bottom of Radio Interference-Field Intensity Meter IM-36/URM-6 so that the RI-FI Meter can be mounted on Tripod MT-674/U, if desired.

Topography of the survey site might require the dipole antenna location be approximately 20 feet from the location of the RI-FI Meter. In this case, it would be convenient to use the remote Ammeter ME-31/U at the antenna, when turning the antenna to obtain a null indication and magnetic bearing. Connect the remote meter to the REMOTE METER receptacle on the RI-FI Meter, using the remote meter Cable Assembly CG-571/U (20′ 0″). Since Ammeter ME-31/U is not identical to the panel mounted meter, the remote meter readings will not be the same as those of the panel mounted meter. Construct a conversion chart to convert Ammeter ME-31/U readings using the RI-FI Meter as reference. Using the PEAK function of the equipment, adjust the PEAK control to obtain indicator meter readings at the main calibration points on the meter scale. Plot the remote meter readings on the horizontal axis and the RI-FI Meter readings on the vertical axis. Draw a smooth curve through the plotted points.

Note

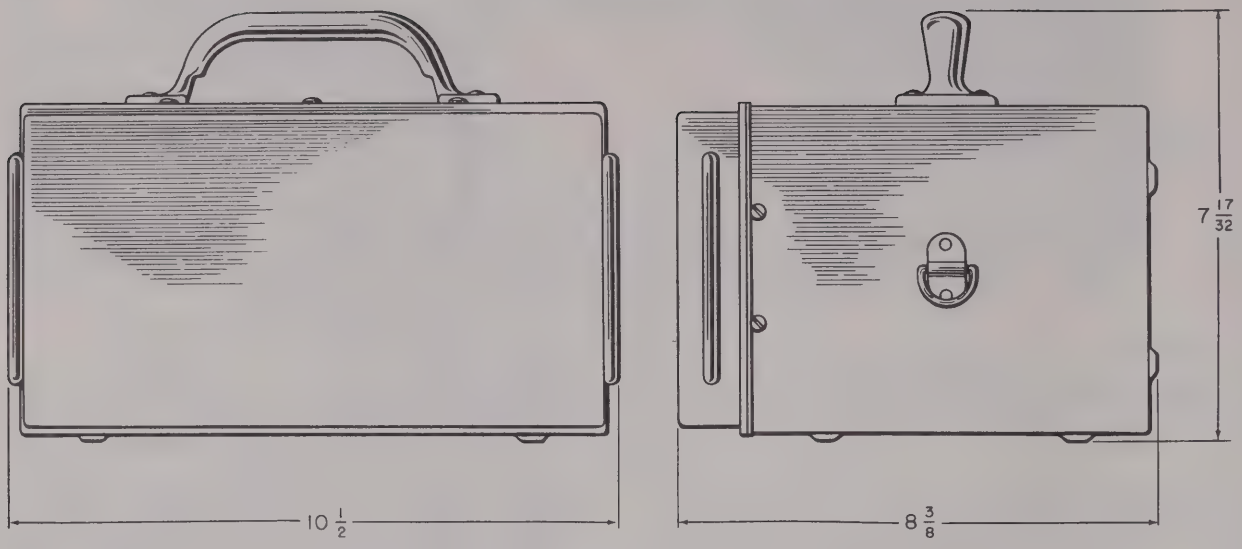
Radio Interference Measuring Set AN/URM-47A contains a remote meter, Ammeter ME-76/U, and its Cable Assembly CG-571/U (20′ 0″) which can be used in the same manner as the Ammeter ME-31/U.

Headphone extension Cable Assembly CG-572/U (20′0″) permits use of headphones at the antenna location.

Note

Radio Interference Measuring Set AN/URM-47A also contains Cable Assembly CG-572/U (20′ 0″) for use with the headphones.

It might also be convenient to use Milliammeter-Recorder RD-59/U to make graphic recordings. In this case, a source of 115 volts ac, 60 cps must be available



NOTE: ALL DIMENSIONS ARE IN INCHES

Figure 3-3. Power Supply PP-906A/URM-47, Outline Drawing

for the synchronous motor in the recorder. The recordings will be approximations only, in view of the fact that the chart ruler supplied with the recorder is not calibrated for use with the RI-FI Meter. A new chart rule can be calibrated however, by using the RI-FI Meter scale as reference. Connect the recorder to the RECORDER CHART DRIVE receptacle on the RI-FI Meter by means of Cable Assembly CG-571/U (6′ 0″). Using the PEAK function of the RI-FI Meter, adjust the PEAK control to obtain indicating meter readings at the main calibration points on the meter scale. Place a strip of clear plastic across the recorder chart and mark the plastic strip at the points obtained from the chart record.

Note

Radio Interference Measuring Set AN/URM-47A does not contain the Special Purpose Cable Assembly CG-571/U (6′ 0″).

In the event of power cable failure in the field, note that the power cables for connection between the RI-FI Meter units and power supply units are identical in Radio Test Sets AN/URM-6, AN/PRM-1, and AN/URM-17, and Radio Interference Measuring Set AN/URM-47A. The power cables for connection between the power supply unit and the external power source are also identical.

The tripod, azimuth dial assembly, and azimuth dial pointer supplied with Radio Interference Measuring Set AN/URM-47A are identical to the units supplied with Noise-Field Intensity Meter TS-587/U and Radio Test Set AN/URM-17.

d. EXTERNAL POWER SOURCE CONNECTION. —The external power source may be either 105-125 or 210-250 volts ac, 50-60 and 400 cps. Connect the plug on the end of Power Cable Assembly CX-3810/U (6′ 6″) to the external source.

Selection of correct circuits for proper operation at the voltage and frequency of the power source is provided by two switches, S302 and S303, located on the chassis of the power supply. Both are two-position switches and legends on the chassis show the setting for each input. The "in use" setting of these switches must be indicated by the reminder tag located on the front panel to the right of the POWER INPUT receptacle (see figure 4—2). Check that the exposed panel and tag markings agree with the voltage and frequency of the power source to be used. If the markings differ from the power source output, remove the ten binding head screws from the power supply case and slide the chassis out of the case. Change the setting of switches S302 or S303, or both if necessary, to correspond with the external voltage and frequency to be employed. Switch S302 switches the input for 115-volt or 230-volt operation, and switch S303 switches the filter system for 50-60 cycles or 400-cycle operation. Slide the chassis back into the case and replace the ten screws previously removed.

Any change in the setting of switches S302 or S303 must be shown by the reminder tag on the panel. If it has been necessary to change the setting of switch S302, loosen the screw that fastens the metal tag on the front panel and rotate the tag 180 degrees to correspond with the voltage setting of switch S302 and the voltage of the source to be used. If the setting of switch S303 has been changed, the screw holding the reminder tag will have to be removed and the tag turned over so that the face reading agrees with the setting of switch S303 and the frequency of the power source used. Replace the screw to hold the tag in position. When this operation has been completed, the position of switch S302 and the visible panel marking must agree with each

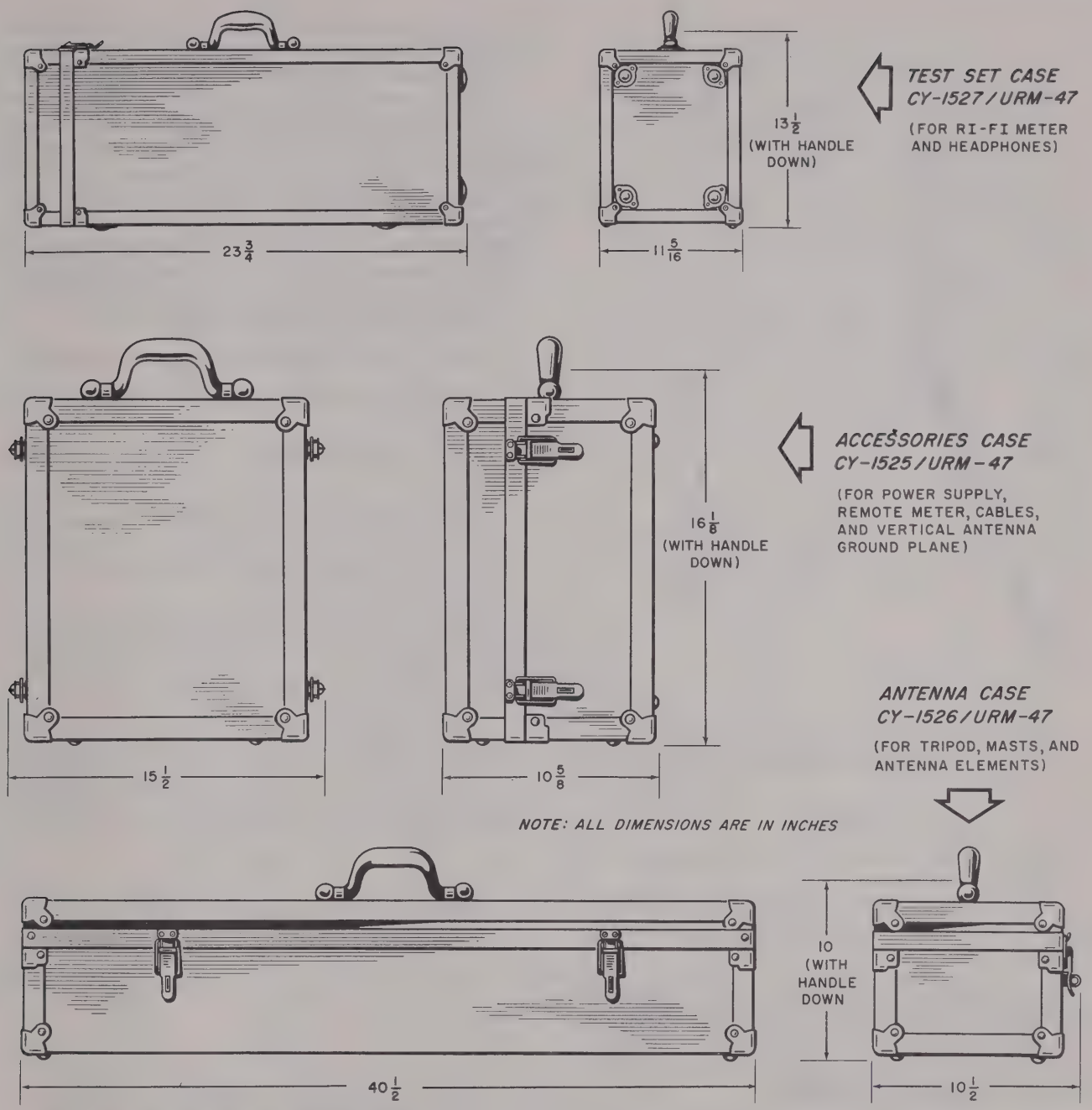


Figure 3-4. Carrying Cases, Outline Drawing

other and voltage of the power source, and the marking on the tag must agree with the position of switch S303 and the frequency of the power source to be used. Tighten the tag screw.

Connect a good ground to the GROUND binding post on the power supply front panel or to the third conductor (from pin B) of a-c Power Cable Assembly CX-3810/U (6′ 6″). Only one ground point should be used because grounding more than one creates a loop in conjunction with the interconnecting cable. To avoid this loop, make sure the case of any ungrounded unit is not inadvertently grounded by placing it on the earth or on a metal surface. This ground connection should be removed when making a conducted measurement with Radio Frequency Cable Assembly CG-1064/U (1′ 6″) since a single ground at the source of measurement is then derived.

3-6. INITIAL ADJUSTMENTS.

a. ELECTRICAL ADJUSTMENTS. — All internal alignment and calibration adjustments on Radio Interference Measuring Set AN/URM-47A have been made at the factory and no further adjustment is required in the field prior to operation.

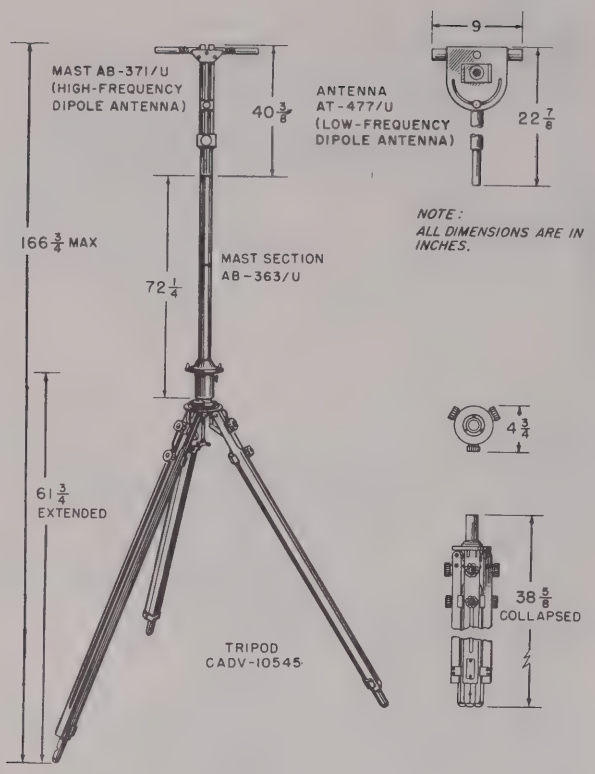


Figure 3-5. Dipole Antenna and Tripod, Outline Drawing

Note

Refer to figures 4—1 and 4—2 for front panel controls.

It is recommended that the following operational checks be made when the equipment has been set up for operation:

Step 1. Check the mechanical zero of the front panel indicating meter. If the pointer is off zero, correct as necessary by means of the screw located on the meter cover. This must be done with power supply POWER switch S301 in the OFF position.

Step 2. Turn the POWER switch S301 to ON. The power supply pilot light I301 and the dial light I101 of the RI-FI Meter should light. The equipment is ready for operation after a few minutes warm-up.

Step 3. After a warm-up period of 15 minutes, set the function switch to the BFO position. The meter output indication should be at zero. If different from zero by more than 1/16-inch deflection, an adjustment must be made. Leaving the function switch in the BFO position, remove the RI-FI Meter chassis from its case and adjust the Adj. Zero control R213 for a zero meter indication. (The Adj. Zero control R213 is a locking type potentiometer; first unlock, use screwdriver for adjustment, then lock again.) Slide chassis back into its case.

Step 4. Set the function switch to the FIELD INTENSITY position. Set attenuator to the $X10^2$ position. (The attenuator can be rotated by first pulling the knob, turning to correct position, and then pushing the knob back.) Set the CALIBRATE control R128 fully counterclockwise. With no r-f input signal applied to the RF INPUT receptacle J101, the indicating meter M101 should show a slight deflection above zero, that is, approximately 1 per cent (1/16-inch) of full scale. (If the meter indicates an appreciable deflection in either direction of more than 1 per cent, an internal adjustment may be required. See step 3, preceding. If no adjustment is required, continue the operational check.)

Step 5. Set the attenuator to the CAL position.

Step 6. Set the function switch to the CAL position.

Step 7. Rotate the PEAK control R231 maximum clockwise.

Step 8. Rotate the PEAK SENS. control R191 clockwise until the PEAK indicator lamp I102 lights, then rotate the control counterclockwise until the lamp just ceases to blink.

Step 9. Adjust the PEAK control R231 for the output meter indication provided on the calibration Charts Nos. 1 and 2 for the radio frequency desired.

Step 10. Turn the CALIBRATE control R128 clockwise until the PEAK indicator lamp I102 blinks at the impulse calibrator repetition rate (approximately 12 to 15 pulses per second), then rotate the control slowly counterclockwise until the lamp just ceases to blink.

Note

The exact calibrator repetition rate may differ between equipments.

Step 11. The equipment is now standardized for gain.

Note

This standardization procedure is valid for only one frequency. Repeat the entire procedure (steps 5 through 10) for each new frequency.

Step 12. Set function switch to FIELD INTENSITY position. Using an appropriate antenna, tune through the six frequency bands listening for signals to determine that the equipment operates on each band. Select an attenuator setting for on-scale meter indication and an AUDIO control R182 setting required to give a comfortable audio volume level in the headphones.

Step 13. Check the slide-back feature of the equipment as follows: With the antenna still connected, and with the equipment tuned to a modulated (or interference) signal, turn the function switch to the PEAK

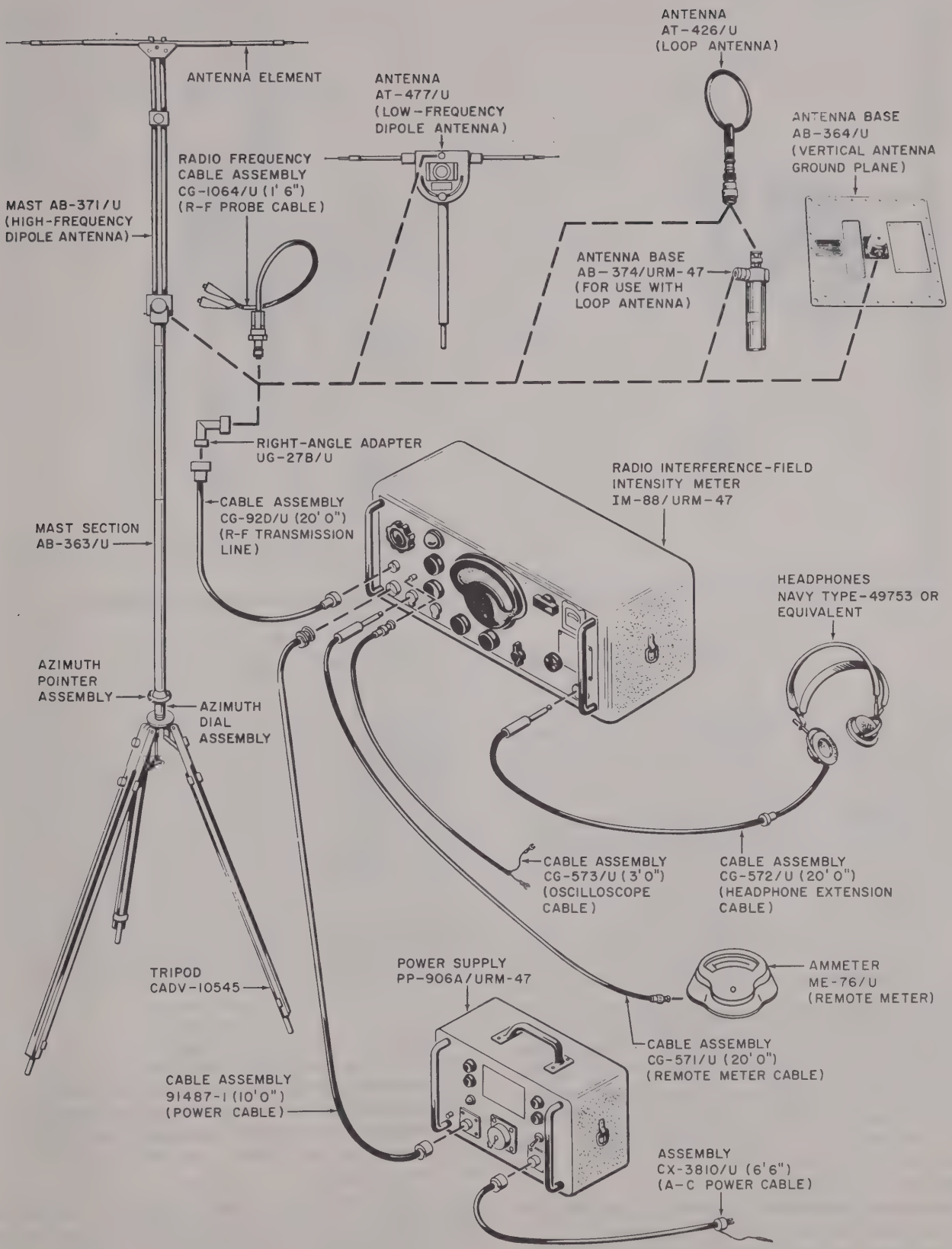


Figure 3-6. Radio Interference Measuring Set AN/URM-47A, Connection Diagram

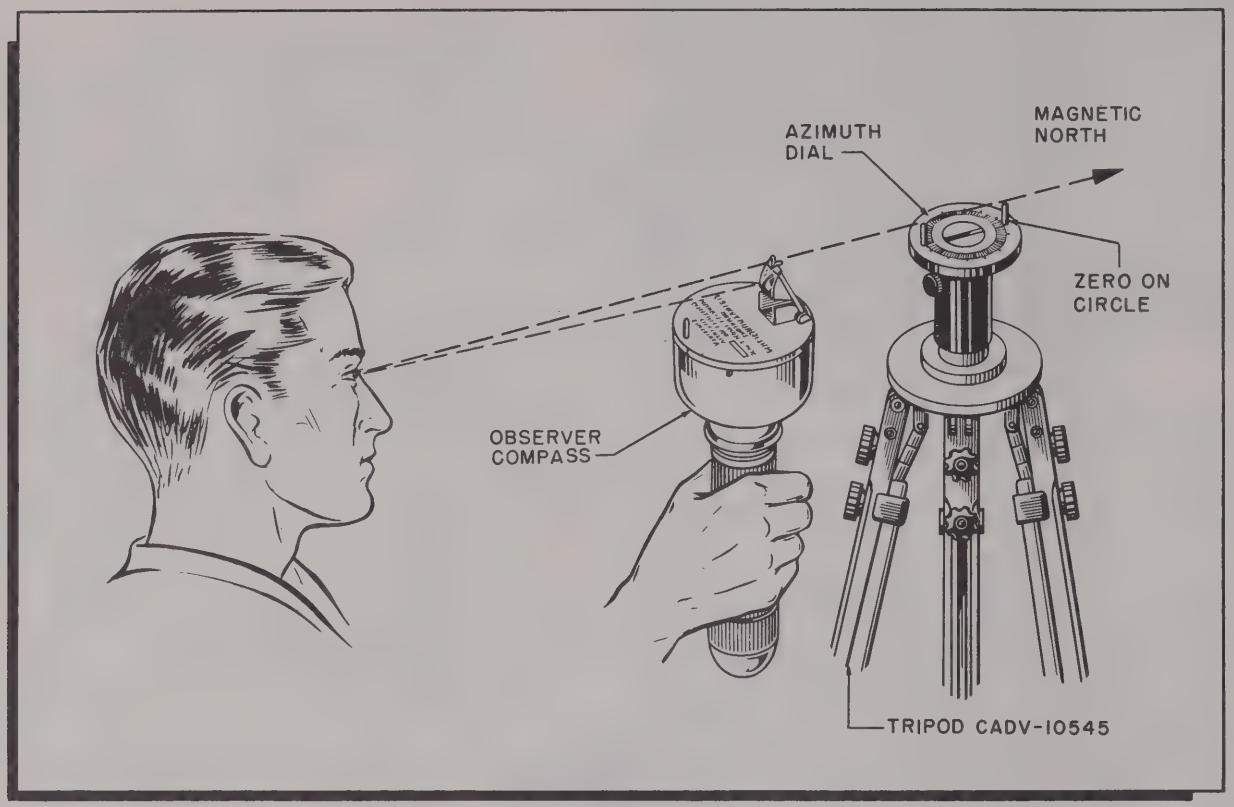


Figure 3-7. Method of Indexing Azimuth Dial on Tripod

position. From its fully counterclockwise position, turn the PEAK control slowly in a clockwise direction until the received headphone signal just becomes inaudible. Observe the pointer of the indicating meter as the point of inaudibility is approached. If the pointer goes off-scale, set the attenuator control to the next higher position, using the required PULL-TURN-PUSH sequence. Return the PEAK control to the fully counterclockwise position, then readjust until the headphone signal just becomes inaudible.

b. ORIENTING THE DIPOLE ANTENNA. *(See figures 3–7, 3–8, and 3–9.)*—Approximate magnetic bearings of a signal source may be obtained with Radio Interference Measuring Set AN/URM-47A. The approximate bearing of the signal source is given by the azimuth circle on the tripod head on which the antenna and antenna mast are mounted. However, each time the tripod is moved from one location to another, the azimuth dial must be oriented with respect to magnetic north. One method to accomplish this alignment and orientation is by means of the Observer Compass Mark 1 Mod 0 (not furnished).

The observer compass was designed for obtaining distant shore bearings from a ship. It consists of a liquid-filled compass bowl and card with means of illuminating the card, and a prism for permitting the direct reading of the card while sighting upon an object. A two-cell flashlight of non-ferrous construction, without the usual head containing lens and reflector, is fitted into the bottom of the compass bowl. The light from the flashlight bulb passes through a red plate to the translucent compass card. A switch on the side of the flashlight turns the light on and off. The prism above the compass is hinged to provide an adjustment in the angle between the line of sight from the eye to the distant point being observed and the image of the compass card in the prism. An open sight is also provided on the prism mounting. The lubber line above the compass card functions as the other sight in alignment with the object on which bearings are being taken.

CAUTION

Iron objects should be removed from pockets and all metallic tools etc., should be removed from the vicinity before reading the magnetic compass. Magnetic compasses are particularly unreliable near power lines and near metallic structures.

To orient the azimuth dial temporarily remove the dipole antenna and the antenna mast. Turn the azimuth dial so that zero is at the north side as close as may be estimated. Hold the compass upright and level in the hands or, if possible, rest upon a support of suitable

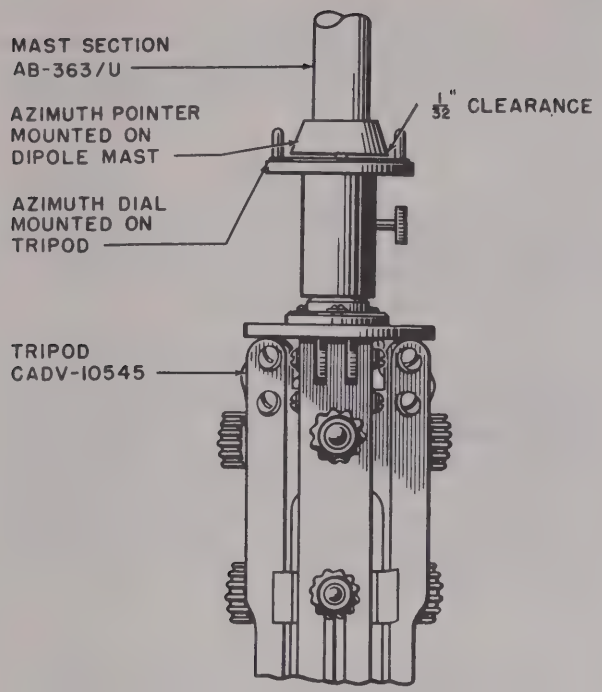


Figure 3-8. Azimuth Dial and Azimuth Pointer Assemblies Mounted on Tripod

height. Take a position such that the open sight above the prism on the compass is on a level with the sighting pins of the azimuth dial. Adjust the prism up or down until the compass card can be seen clearly. Then vary the position of the observer until the compass card reads exactly north (360 degrees), the open sight and the lubber line are exactly in line with the 360-degree mark, and the line of sight passes directly over both of the sighting pins of the azimuth dial. It will be necessary to turn the dial to adjust its position as successive sights are taken with the observer compass, until the desired alignment is attained. At this point, tighten the lock screw on the azimuth dial, being careful not to move the dial while doing so.

There is an efficient bubble trap around the periphery of the compass bowl. If a bubble appears during the use of the compass, turn the compass upside down and slowly return it to the upright position. This puts the bubble behind the bubble trap where it will not be visible nor disturb the action of the compass card.

Place the mast section in the sleeve on the tripod head (see figure 3—8). Tighten the mast screw under the tripod head to secure the mast to the tripod. Check that the index line on the azimuth pointer assembly on the base of the mast is directly in line with the vertical azimuth dial pins. If necessary, the azimuth pointer can be moved as follows: Loosen the two set screws on the pointer with an Allen wrench. With the pointer at the proper position to provide a clearance above the azimuth dial (1/32 inch), turn the pointer to bring the index line in line with the plane which passes through the dipole elements and mast (see figure 3—9). Tighten

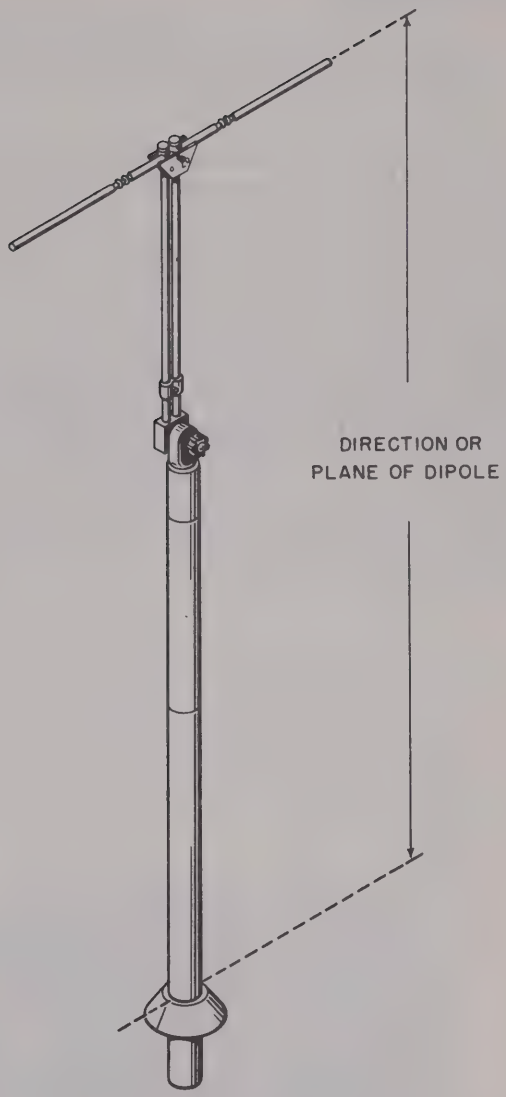


Figure 3-9. Method of Checking Azimuth Pointer Assembly for Angular Position

the two set screws. Make certain that the spring steel collar inside the azimuth pointer is in place when the set screws are tightened.

3-7. TRANSPORTING THE EQUIPMENT.

a. PACKING IN CARRYING CASES.—Safe stowage for each unit and accessories of Radio Interference-Field Intensity Meter AN/URM-47A is provided in the carrying cases supplied. These cases are adequate packing for transporting the equipment from one survey site to another.

Note

The interior of each carrying case contains a plate displaying the equipment which should be packed in the individual carrying case. To prevent loss of equipment personnel responsible for repacking the equipment should place

a check mark in the box following the name of each item as it is packed in the case. (See figures 1—2, 1—4, and 1—6.)

Wipe all units and accessories with a dry cloth before stowing in the cases. This applies in particular to the tripod. In order to stow the tripod properly and to protect the sighting pins on the azimuth dial, invert the dial over the sleeves on the tripod head. Insert a finger in the azimuth dial assembly to compress the internal leaf spring. The azimuth dial assembly will then fit over the sleeves of the tripod head. Replace the various units in the cases in the positions they occupied when received. Be sure to collapse the tripod legs fully before stowing in its case. When the RI-FI Meter is replaced in its case, make certain that the four rubber feet of the unit are toward the back of the carrying case (toward the hinged portion of the case cover). When replacing the low-frequency dipole antenna, make sure that the mast is turned to the position marked STOW on the front of the dipole head, otherwise it will not fit into its carrying case.

CAUTION

The carrying cases are drip-proof but not designed to withstand severe exposure to the elements. Cases should be covered with tarpaulin when left in the open overnight.

b. PACKING IN SHIPPING CASE.—The three carrying cases are not intended to be sufficient packing for transport by common carrier. Pack the carrying cases in the original shipping case as shown in figure 3—1. If the original shipping case was not retained, construct one according to the data in that illustration. Use ¾-inch lumber and provide the required waterproof barriers and cellulose wadding.

SECTION 4

OPERATION

4-1. INTRODUCTION.

Radio Interference Measuring Set AN/URM-47A is basically a meter intended for intensity measurements of all types of radio-frequency energy in the frequency range of 20 to 400 megacycles.

The RI-FI Meter includes a sensitive receiver and a vacuum-tube voltmeter (VTVM) section. It also contains internal means for standardizing the receiver gain.

With an input impedance of 50 ohms, r-f voltage from 1 microvolt to 0.1 volt may be measured. In terms of field intensity, 1.2 microvolts-per-meter to 60 volts-per-meter (depending on frequency) may be measured utilizing the antennas furnished.

In operation, the type of measurement is selected by means of the function switch. The FIELD INTENSITY function of the RI-FI Meter affords measurement in

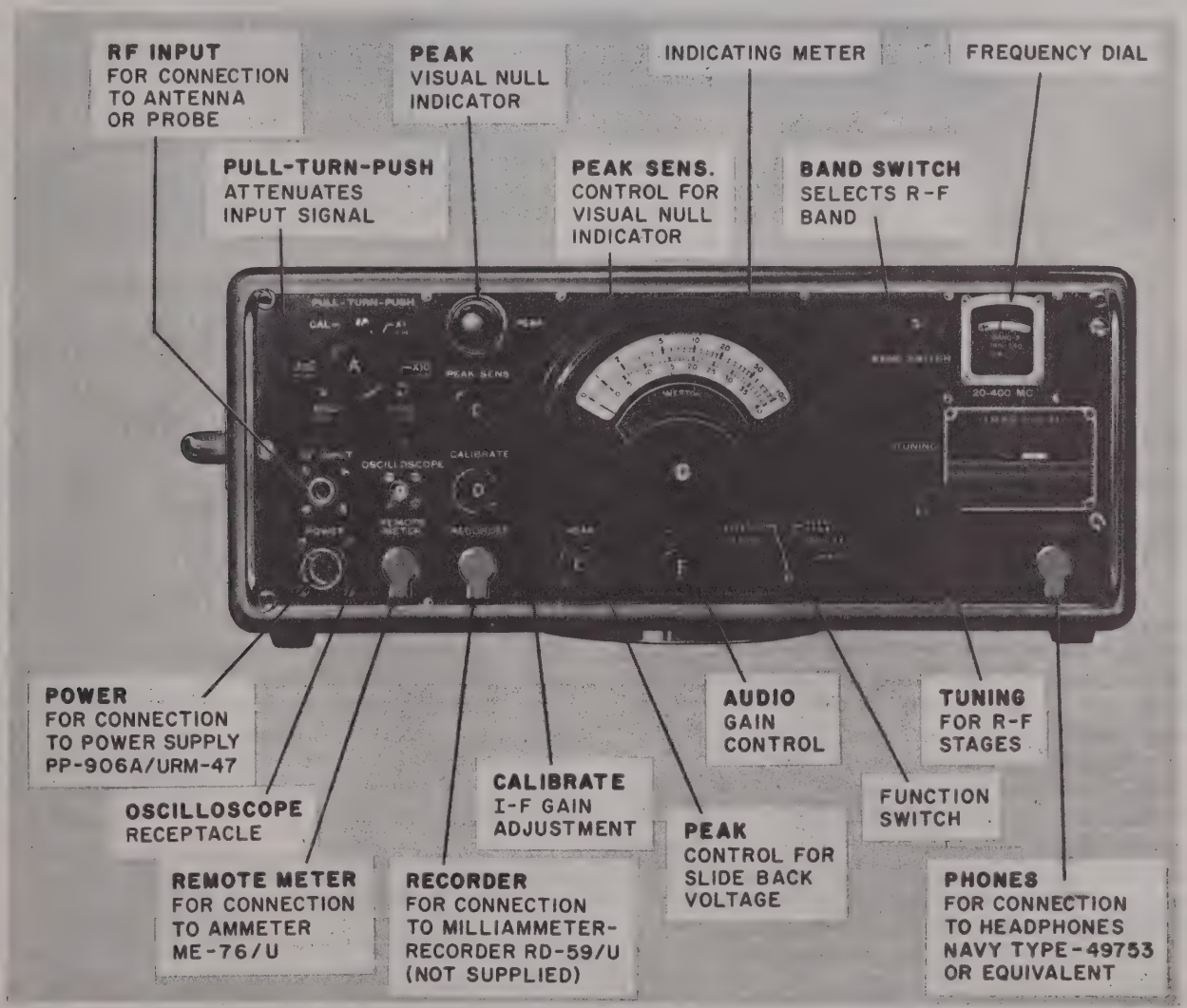


Figure 4-1. Radio Interference-Field Intensity Meter IM-88/URM-47, Panel Controls and Receptacles

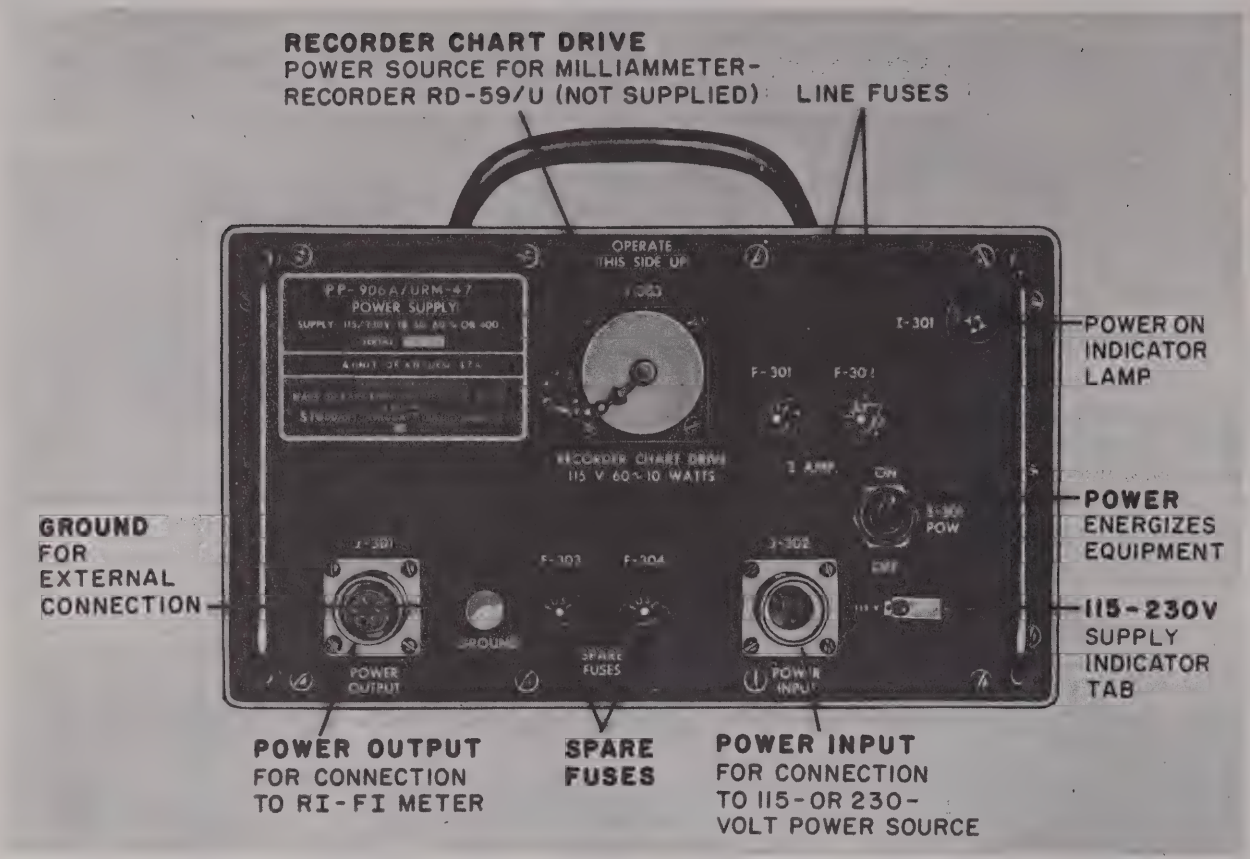


Figure 4-2. Power Supply PP-906A/URM-47, Panel Controls and Receptacles

terms of the average value, the QUASI PEAK function in terms of the weighted value, and the PEAK function in terms of the peak value of the signal or interference as it appears at the input to the second detector.

The RI-FI Meter does not measure the absolute peak value of impulsive interference because impulsive response is dependent upon the effective impulsive bandwidth, the energy of the pulse (product of amplitude and duration), and the second detector characteristics of the measuring equipment. The effective duration (duration of rectangular envelope of the same peak value) of the pulse, after passing through the various tuned circuits, is exactly inverse of the RI-FI Meter effective impulsive bandwidth. Tuned circuits in the RI-FI Meter shape the pulse signal so that its peak amplitude is decreased and its duration is lengthened. The PEAK function of the RI-FI Meter measures the peak value of the shaped pulse as it appears at the input to the second detector. This value can be converted to a per-megacycle-bandwidth basis by application of a factor depending upon the effective impulsive bandwidth of the RI-FI Meter at the measured frequency. When expressed in terms of per-megacycle-bandwidth, the result may be correlated with similar readings obtained from other measuring equipment expressed in the same units.

4-2. EQUIPMENT CONTROLS AND RECEPTACLES.

(See figures 4—1 and 4—2.)

The operating controls of the RI-FI Meter and Power Supply PP-906A/URM-47 are all located on the front panel of the units. The receptacles to which external connections are made are also located on the front panels.

The function of each control and receptacle is briefly described by an adjacent panel marking or by panel markings identifying the various control positions. In table 4—1, the panel marking or legend is explained and the applicable symbol designation is given in parentheses after the legend to aid in identifying the circuit components. As another means of identification, control knobs have been colored and marked with a letter; these letters and knob colors precede the panel marking.

4-3. DESCRIPTION OF CHART SET PT-188/URM-47.

(See figures 4—3 through 4—8.)

Chart Set PT-188/URM-47 consists of a series of eleven vinylite sheets containing simplified operating instructions and a family of calibration curves that are plotted *for each individual* RI-FI Meter.

TABLE 4-1. DESIGNATION AND FUNCTION OF PANEL CONTROLS AND RECEPTACLES

LEGEND	FUNCTION
	RI-FI Meter
(A) (BLACK) PULL-TURN-PUSH (S101, E136 through E141)	Attenuation control.
CAL	Blanks r-f input to receiver and connects impulse generator to receiver input.
X1 0DB	Does not attenuate i-f or r-f signal.
X10 +20DB	Does not attenuate r-f signal but does attenuate i-f signal 20 db.
$X10^2$ +40DB	Attenuates r-f signal 20 db and i-f signal 20 db.
$X10^3$ +60DB	Attenuates r-f signal 40 db and i-f signal 20 db.
$X10^4$ +80DB	Attenuates r-f signal 60 db and i-f signal 20 db.
RF INPUT (J101)	R-f input receptable.
POWER (J106)	Power input receptacle.
OSCILLOSCOPE (J107)	Oscilloscope receptacle for visual monitoring.
REMOTE METER (J110)	Receptacle for remote meter connection.
PEAK (I102)	Indicator lamp to provide a visual null indication.
(E) (GREEN) PEAK SENS. (R191)	Control for visual null indication.
(D) (RED) CALIBRATE (R128)	Adjusts gain of i-f section to standardize receiver gain.
RECORDER (J111)	Receptacle for milliammeter recorder connection.
(C) (GREEN) PEAK (R231)	Control for furnishing slide-back voltage for peak measurements.
(F) (BLACK) AUDIO (R182)	Adjusts aural monitoring level.
(B) (BLACK) Function Switch (S102)	
CAL	Position used for standardizing receiver gain. Places calibrator circuit in operation.
FIELD INTENSITY	Weights signal for field intensity measurements.
QUASI PEAK	Weights signal for quasi-peak measurements.
PEAK	Provides signal to detector for slide-back voltage measurements.
BFO	Places beat frequency oscillator in operation for c-w reception. BFO not used in making measurements: used for identification of signals only.
(G) (BLACK) BAND SWITCH	Selects tuned circuits in the r-f amplifier, mixer, and local oscillator stages for six frequency bands.
(H) (BLACK) TUNING	Operates tuning capacitors of the r-f amplifier, mixer, and local oscillator stages to vary tuning.
PHONES (J108)	Headphone receptacle for aural monitoring.

TABLE 4-1. DESIGNATION AND FUNCTION OF PANEL CONTROLS AND RECEPTACLES (Cont'd)

LEGEND	FUNCTION
Power Supply	
GROUND	Ground post for connection to external ground.
F303, F304	2-ampere spare fuses.
I301	Power-on indicator lamp.
POWER OUTPUT (J301)	Receptacle for operating potential supply to RI-FI Meter.
RECORDER CHART DRIVE (J303)	Power source for Milliammeter-Recorder RD-59/U, or equivalent. *Used only when external power source frequency is 60 cycles.*
F301, F302	2-ampere active line fuses.
POWER (S301)	ON-OFF switch.
ON	Energizes the equipment.
OFF	De-energizes the equipment.
POWER INPUT (J302)	Receptacle for external source input power.

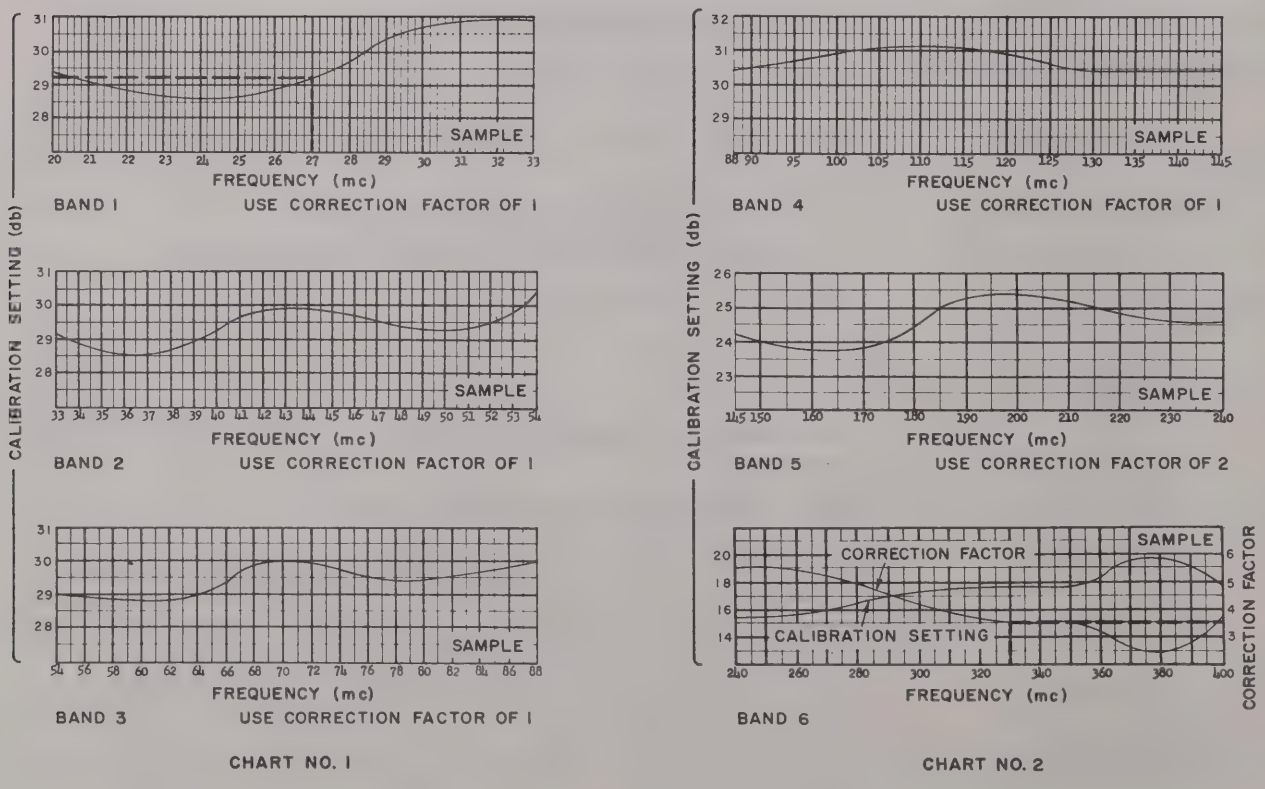
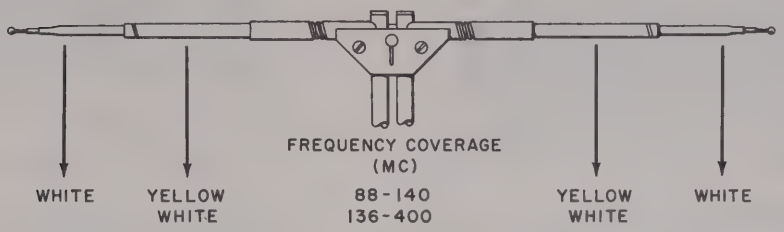
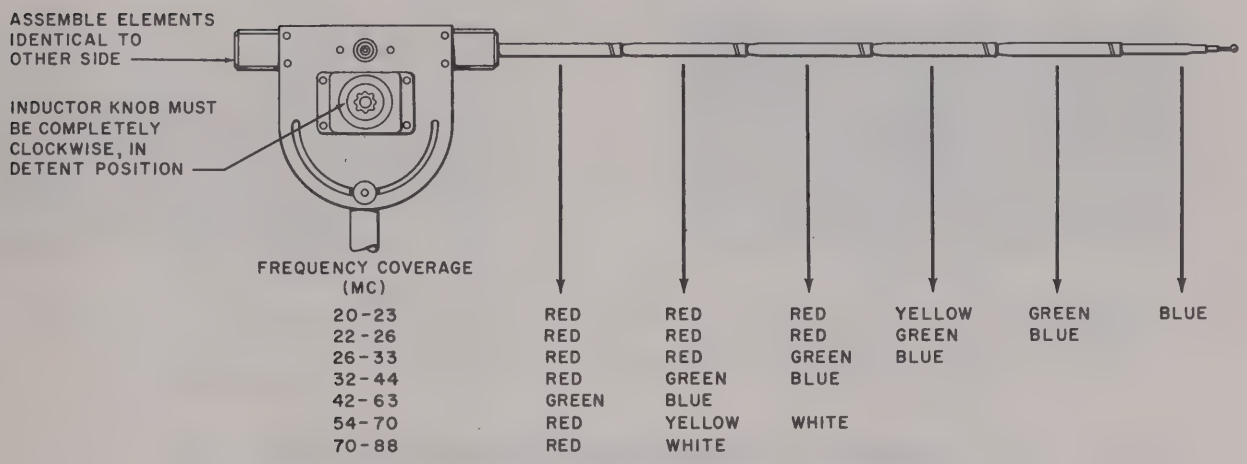


Figure 4-3. Calibration Settings, Bands 1 through 6 (Charts Nos. 1 and 2)

1. HIGH FREQUENCY DIPOLE: MAST AB-371/U (88-400 MC)



2. LOW FREQUENCY DIPOLE: ANTENNA AT-477/U (20-88 MC)



FREQUENCY COVERAGE (MC)						
20-23	RED	RED	RED	YELLOW	GREEN	BLUE
22-26	RED	RED	RED	GREEN	BLUE	
26-33	RED	RED	GREEN	BLUE		
32-44	RED	GREEN	BLUE			
42-63	GREEN	BLUE				
54-70	RED	YELLOW	WHITE			
70-88	RED	WHITE				

3. FIXED LENGTH DIPOLE: ANTENNA AT-477/U (20-50 MC)

ADJUST DIPOLE LENGTH TO 50 MEGACYCLES (USE TABLE 2 ABOVE). TUNE INDUCTOR FOR MAXIMUM READING OF OUTPUT METER AT FREQUENCY OF SIGNAL BEING MEASURED. ALTERNATIVELY, USE FOLLOWING APPROXIMATE VALUES OF SCALE SETTING VS. FREQUENCY.

FREQUENCY (MC)	INDUCTOR SCALE	FREQUENCY (MC)	INDUCTOR SCALE
20	2.6	35	8.1
22	4.4	40	9.0
25	5.3	45	9.5
30	7.0	50	DETENT

4. VERTICAL ANTENNA: ANTENNA BASE AB-364/U (20-400 MC)

THE VERTICAL ANTENNA IS CONSIDERED AS ONE-HALF OF A DIPOLE. USE DATA SHOWN ABOVE FOR ADJUSTING ONE-HALF DIPOLE. VERTICAL ANTENNA FACTORS SHOWN ON CHART NO. 5 ARE BASED ON THE USE OF A GROUND PLANE ATTACHED TO THE ANTENNA BASE CONSISTING OF 24 COPPER WIRES 160 INCHES LONG RADIATING EVENLY ABOUT THE CENTER.

CHART NO. 3

Figure 4-4. Antenna Adjustments Data (Chart No. 3)

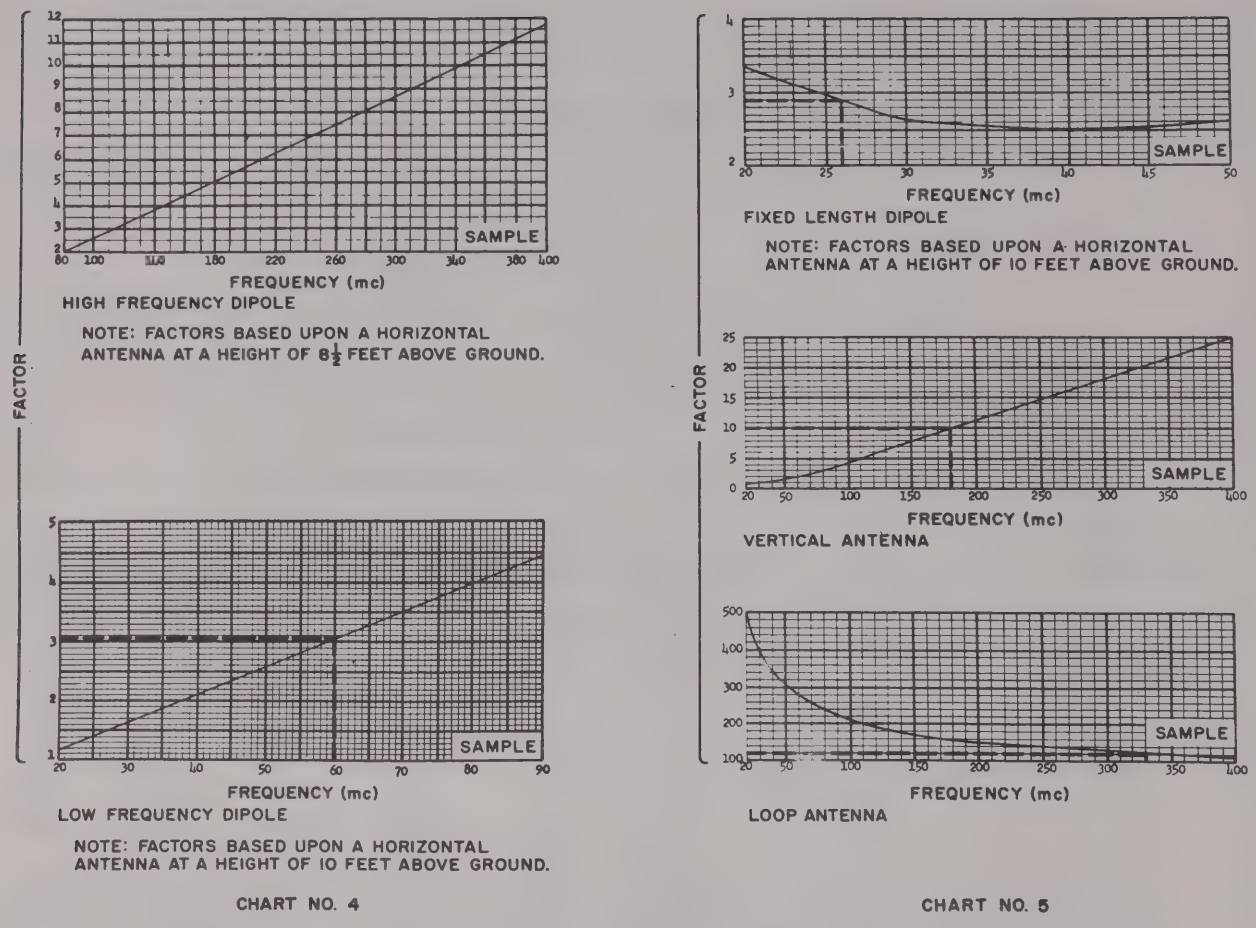


Figure 4-5. Correction Factors (Charts Nos. 4 and 5)

The first two sheets supply simplified operating instructions, including instructions for the proper use of the curves on succeeding sheets.

Note

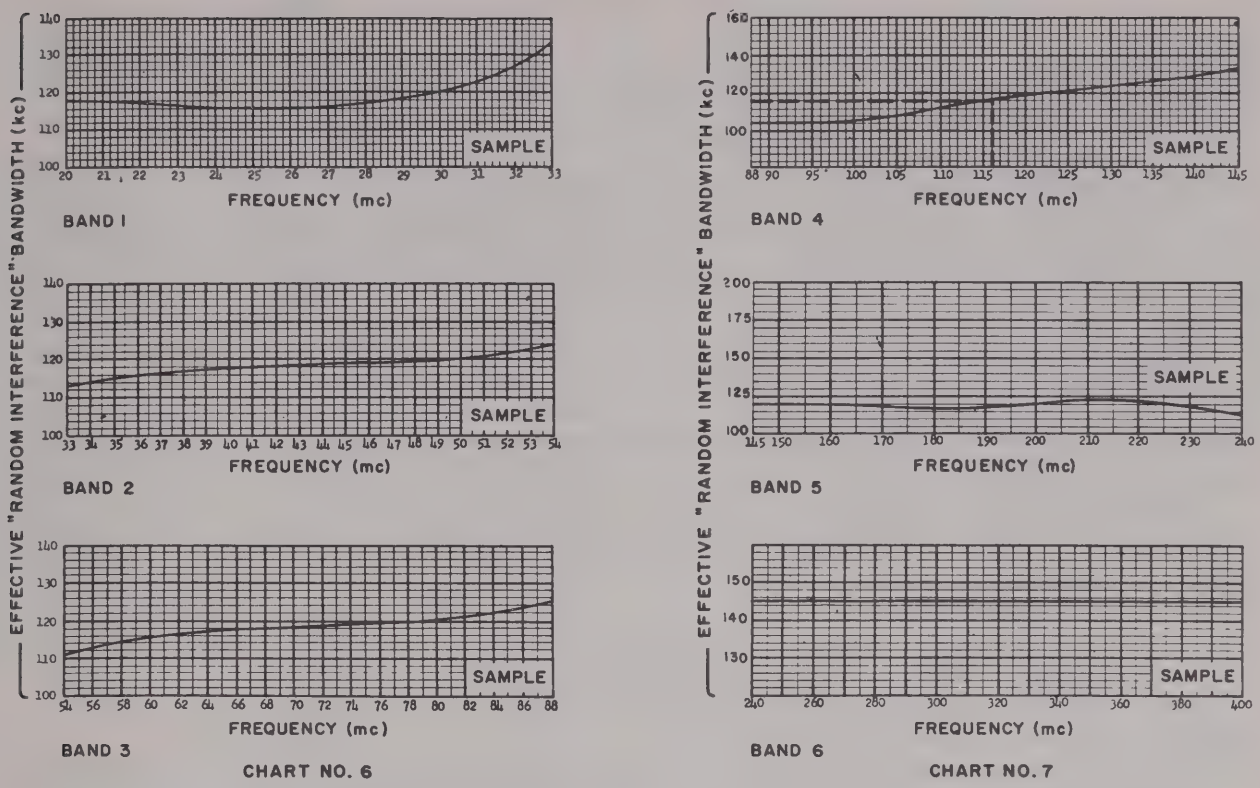
Sample curves are plotted in the chart illustrations given here. *Do not use these sample charts for calibrating equipments.*

Before making a measurement on a given frequency, it is necessary to adjust the gain of the RI-FI Meter, by means of the CALIBRATE control (D). The calibration reading is taken from Charts Nos. 1 and 2 which contain six curves covering the six frequency bands (figure 4–3).

Chart No. 3 (figure 4–4) provides antenna assembly data in tabular form. Information is presented for selection of antenna head, number and type of antenna sections and assembly sequence for tuning an antenna to a desired frequency.

Chart No. 4 (figure 4–5) contains curves for determining the $\lambda/2$ self-resonant dipole correction factor at any frequency throughout the six bands. These factors, when multiplied by the meter reading in microvolts, result in the field intensity measurement in microvolts-per-meter.

Chart No. 5 (figure 4–5) contains a curve for determining the dipole correction factor at any frequency between 20 and 50 megacycles when the dipole length is fixed at a self-resonant length at 50 megacycles. This is useful where space is limited and it is not practical to extend the dipole elements to the lower frequency $\lambda/2$ dipole self-resonant length. These factors, when multiplied by the meter reading in microvolts, result in the field intensity measurement in microvolts-per-meter. Chart No. 5 also contains a curve for determining the approximate vertical antenna correction factor at any frequency throughout the six bands. These factors, when multiplied by the meter reading in microvolts, result in the approximate field intensity in microvolts-per-meter. Chart No. 5 also contains a curve for determining the approximate loop probe correction factor at any frequency throughout the six bands. These factors, when multiplied by the meter reading in microvolts, result in the approximate field intensity in microvolts-per-meter.



NOTES: THE EFFECTIVE IMPULSIVE BANDWIDTH CAN BE DETERMINED BY MULTIPLYING THE EFFECTIVE "RANDOM INTERFERENCE" BANDWIDTH BY A FACTOR OF 1.50.

THE 6 db BANDWIDTH CAN BE DETERMINED BY MULTIPLYING EFFECTIVE "RANDOM INTERFERENCE" BANDWIDTH BY A FACTOR OF 1.35.

Figure 4-6. Bandwidth Data, Bands 1 through 6 (Charts Nos. 6 and 7)

Charts Nos. 6 and 7 (figure 4–6) contain curves for determining the effective "random interference" bandwidth for any given frequency within the range of the equipment. Included on the charts are factors by which the effective "random interference" bandwidth may be converted to the 6 db bandwidth or to the effective impulsive bandwidth. A detailed description on the use of these different bandwidths is given in paragraph 4-7.*b.*(3).

Note

Wherever the terms "Random Noise Bandwidth" and "Impulse Noise Bandwidth" appear in Chart Set PT-188/URM-47, these terms are the "Effective Random Interference Bandwidth" and "Effective Impulsive Bandwidth", respectively.

Chart No. 8 (figure 4–7) is a correction chart used for determining a true measurement of sine wave signal strength in the presence of high ambient interference of random nature. Two measurements are required—one of the signal plus interference, and one of the interference alone.

Chart No. 9 (figure 4–8) is in two parts. One part is a scale from which the square root of the bandwidth may be determined. It is used when converting microvolt readings of random interference to microvolt-per-kilocycle values. The other part is a chart which supplies correction factors for use when measuring impulsive interference signals directly in terms of microvolts-per-kilocycle bandwidth.

4-4. OPERATING INSTRUCTIONS.

a. INTRODUCTION. – Instructions for connecting the various input devices and the remote meter are given in Section 3. A statement of the type of input device required will be given here.

Note

The word "signal" is used here to designate any r-f input to the equipment, i.e., sine wave, random interference or impulsive interference.

The input devices include the low- and high-frequency dipole antennas vertical antenna, and loop antenna. These units are all connected via Cable Assembly CG-92D/U (20′ 0″) to the RF INPUT receptacle J101.

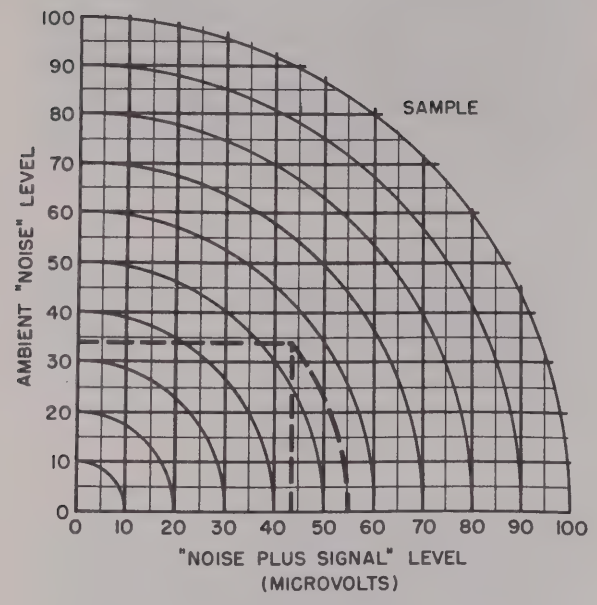


Figure 4-7. Correction Chart for Sine Wave Signals in the Presence of High Ambient Interference of Random Nature

b. USE OF DIPOLE ANTENNAS.—The dipole antenna is used for field intensity and interference measurement, that is, for measuring the intensity of the signal in microvolts-per-meter, and determining the approximate bearing of a signal source. The antenna must be adjusted for frequency, height above ground, type of polarization, and incident angle of the received signal.

(1) MAST AB-371/U AS A HALF-WAVE DIPOLE.—This antenna is used as a self-resonant dipole in the frequency range 88 to 400 megacycles. See figure 4—9 for illustration of the high-frequency dipole antenna adjustments. The end of Measuring Tape TL-635/U is attached to the hook at the top of the antenna and pivoted thereby so the length of the telescoping sections and balun shorting bar can be adjusted to correspond to the operating frequency. For operation at 130 megacycles, for example, use two yellow rods and two white telescoping sections (see Chart No. 3). Screw the yellow rods into dipole head stubs and screw the white telescoping sections into end of rods. Adjust the telescoping sections so the outer ends coincide with the 130-megacycle index on the frequency tape. Pivot the tape to the axis of the matching stubs. Loosen the lock screw on the shorting bar and adjust the *upper edge* of the bar to coincide with the 130-megacycle index on the frequency tape. Lighten the lock screw. The high-frequency half-wave dipole correction factors provided in Chart No. 4 are based on an antenna in a horizontal position and at a height of 8½ feet above ground.

Note

Use table 4—2, Frequency vs. Antenna Element Length, when Measuring Tape TL-635/U is not available to the operator.

(2) ANTENNA AT-477/U AS A HALF-WAVE DIPOLE.—This antenna is used in the frequency range 20 to 88 megacycles. See figure 4—10 for illustration of low-frequency dipole adjustments. The end of Measuring Tape TL-635/U is attached to the hook at the top of the antenna and pivoted thereby so the length of the telescoping sections can be adjusted to correspond to the operating frequency. For operation at 22 megacycles, for example, use six red rods, two yellow rods, two green tapered rods and two blue telescoping sections (see Chart No. 3). Assemble these sections by screwing together and to the dipole head in the order given. Adjust the telescoping sections so the outer ends coincide with the 22-megacycle index on the frequency tape. The low-frequency half-wave dipole correction factors provided in Chart No. 4 are based on an antenna in a horizontal position and at a height of 10 feet above ground.

Note

Be sure that the tuning knob mounted on the dipole head is in the extreme clockwise position (in detent position) when using the antenna as a self-resonant dipole.

(3) ANTENNA AT-477/U AS A FIXED LENGTH DIPOLE.—This antenna is used in the frequency range of 20 to 50 megacycles. See figure 4—10 for illustration of the fixed-length dipole adjustments. The end of Measuring Tape TL-635/U is attached to the hook at the top of the antenna and pivoted thereby so the length of the telescoping sections can be adjusted to the 50-megacycle mark on the tape. For operation at 27 megacycles, for example, use two tapered green and two blue telescoping sections (see Chart No. 3) and make the adjustments as above. Then rotate the tuning knob mounted on the dipole head for maximum reading of output meter. When it is impossible to tune knob and observe the meter at the same time use approximate values of scale setting vs. frequency shown on Chart No. 3. The fixed length dipole correction factors provided in Chart No. 5 are based on an antenna in horizontal position and at a height of 10 feet above ground.

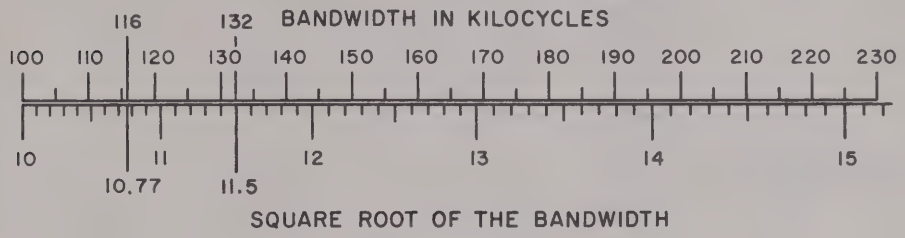
The dipole antenna must also be adjusted to a position corresponding to the polarization of the received signal. Maximum pickup of horizontally polarized waves is obtained with the dipole in a horizontal plane; of vertically polarized waves with the dipole in a vertical plane. Waves of mixed polarization can be received with the dipole tilted at some angle between the horizontal and the vertical.

The directional characteristics of a dipole antenna are such that a maximum pickup is obtained when the

CHART FOR DETERMINING THE SQUARE ROOT OF THE BANDWIDTH

For use when converting microvolt readings of random interference to microvolt-per-kilocycle values

1. Refer to Charts No.6 and No.7 for the effective "random interference" bandwidth
2. Locate the bandwidth value on upper scale of the chart.
3. The square root value of the bandwidth will be found directly below on the lower scale.



CORRECTION FACTORS WHEN MEASURING PULSE INTERFERENCE

For improved accuracy when measuring impulsive interference signals directly in terms of microvolts-per-kilocycle bandwidth. These factors compensate for the CG-92D/U(20') cable losses.

1. Enter the chart from the bottom at the frequency of the signal being observed. Follow upward to intersect the plotted curve.
2. From the point of intersection, follow to the left to find the correction factor.

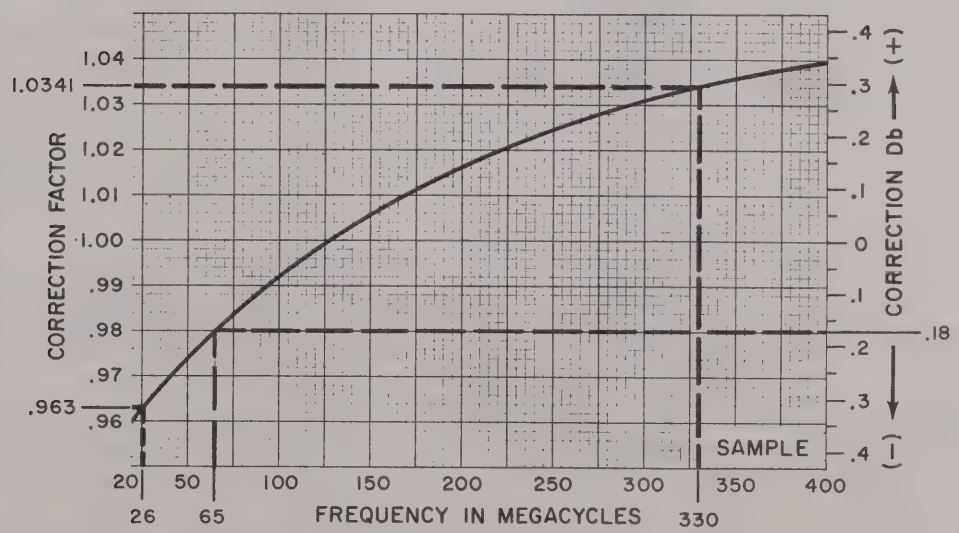


Figure 4-8. Impulsive Interference Signal Correction Factors and Square Root Scale for Bandwdith (Chart No. 9)

dipole is broadside to the signal source. Minimum pick-up is obtained when the signal source is in line with the plane of the dipole.

After tuning the RI-FI Meter to the frequency of the signal under measurement, adjust the length of the dipole elements to correspond to that frequency. Alternately adjust the antenna for polarization and azimuth to obtain a maximum meter reading. Do not make a measurement at this time, for the maximum is broad. Turn the antenna in azimuth until an aural null is obtained.

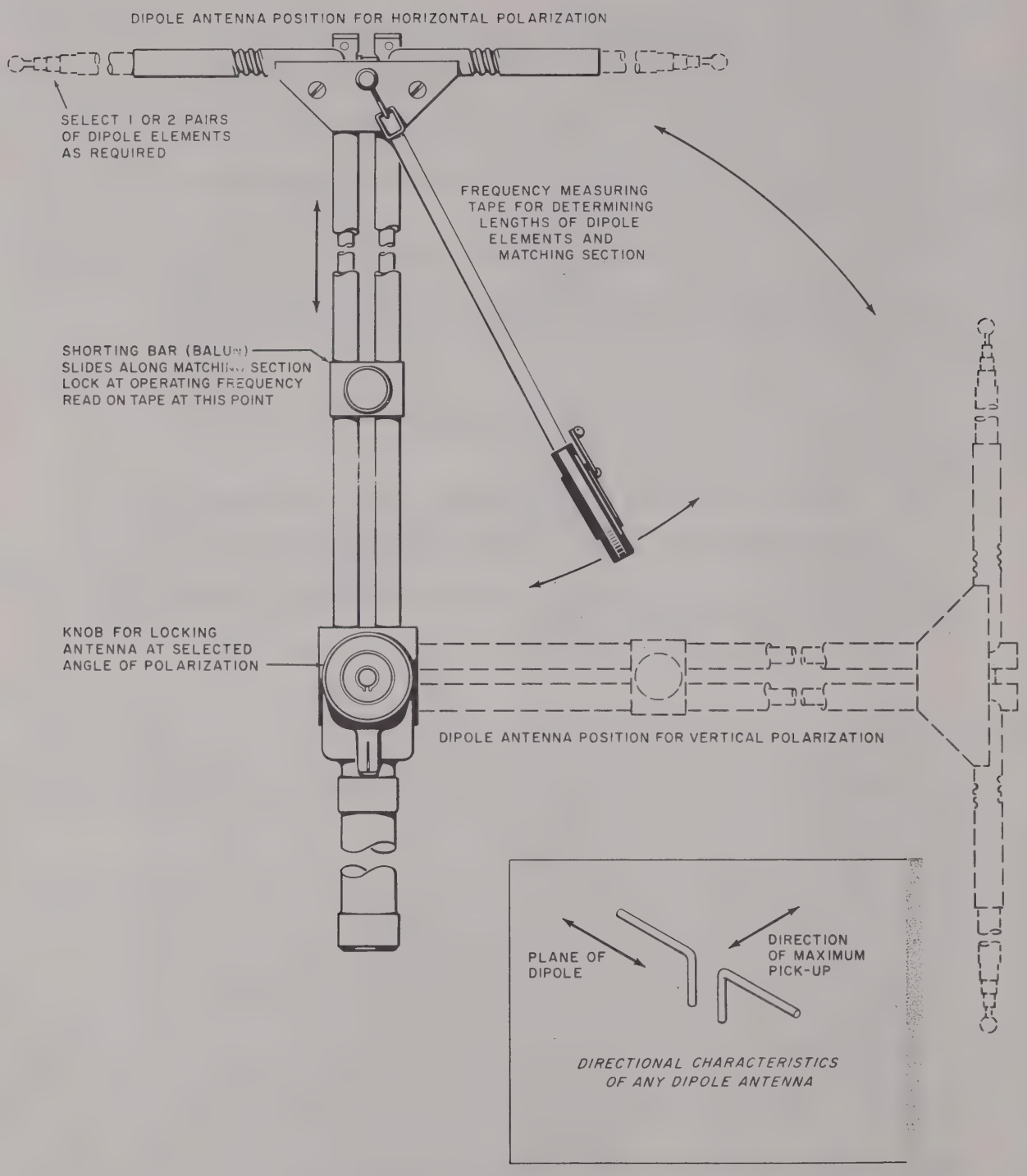


Figure 4-9. Adjustment of Mast AB-371/U (High-frequency Dipole)

TABLE 4-2. FREQUENCY vs. ANTENNA ELEMENT LENGTH

Notes

1. This table is to be used only when Measuring Tape TL-635/U is not available.
2. For one-half dipole length, measure from center of pin on head.
3. Subtract ½ inch from measurements if measured from hook of antenna.

INCHES FROM END	FREQ. (mc)	INCHES FROM END	FREQ. (mc)	INCHES FROM END	FREQ. (mc)	INCHES FROM END	FREQ. (mc)	INCHES FROM END	FREQ. (mc)
7.5	400	11.89	250	20.77	140	41.6	70	86.8	34
7.7	390	12.42	240	21.47	135	44.6	65	89.0	33
7.9	380	13.0	230	22.22	130	48.4	60	91.5	32
8.12	370	13.65	220	23.05	125	53.25	55	94.3	31
8.35	360	14.36	210	24.05	120	59.0	50	97.2	30
8.58	350	15.08	200	25.2	115	61.8	48	100.5	29
8.79	340	15.86	190	26.42	110	64.6	46	104.0	28
9.02	330	16.66	180	27.85	105	67.6	44	107.6	27
9.29	320	17.08	175	29.5	100	70.8	42	111.5	26
9.57	310	17.53	170	31.37	95	74.25	40	115.7	25
9.86	300	18.0	165	33.35	90	76.1	39	120.3	24
10.19	290	18.48	160	34.2	88	78.0	38	125.3	23
10.55	280	18.98	155	35.2	85	80.0	37	130.7	22
10.97	270	19.54	150	37.0	80	82.0	36	137.25	21
11.42	260	20.13	145	39.1	75	84.25	35	145.0	20

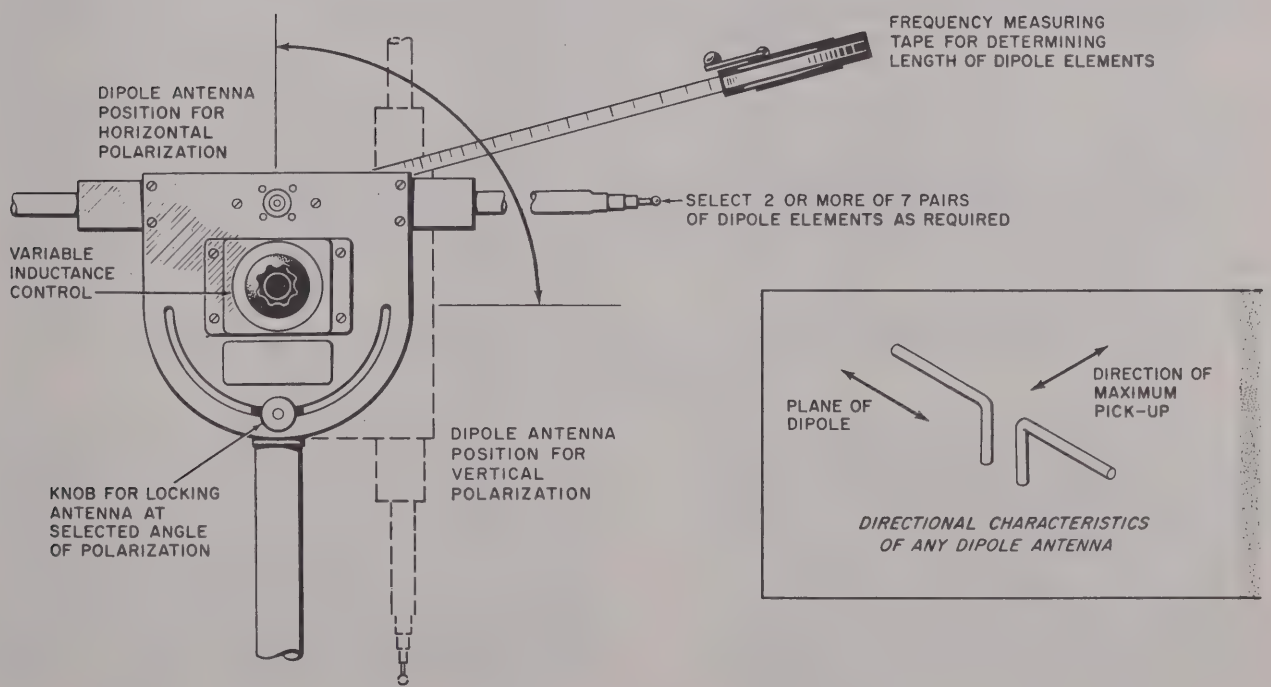


Figure 4-10. Adjustment of Antenna AT-477/U (Low-frequency Dipole)

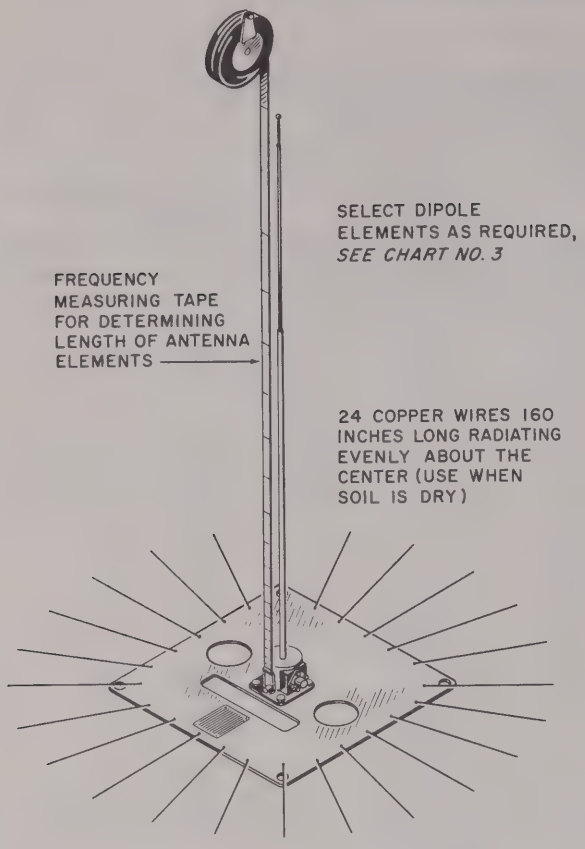


Figure 4-11. Adjustment of Antenna Base AB-364/U (Ground Plane Vertical Antenna)

Note

In the presence of a strong signal, the null will be difficult to obtain. Because sharpest nulls are obtained with the highest feasible attenuator setting, adjust the r-f attenuator control setting as necessary to reduce the signal. Use the indicating meter (M101) in conjunction with headphones to obtain the null indication when there is high acoustical noise at the survey site.

Upon obtaining the null indication, read the approximate magnetic bearing to the signal source, as indicated by the azimuth pointer and azimuth dial. (See Section 3, paragraph 3-6.*b*, for initial alignment of azimuth dial with respect to magnetic north.)

Note

For a more precise bearing, correct the magnetic bearing for the degree of variation at the geographical location of the survey site. Bear in mind that bilateral bearings are obtained with the antenna. The ambiguity must be resolved by triangulation.

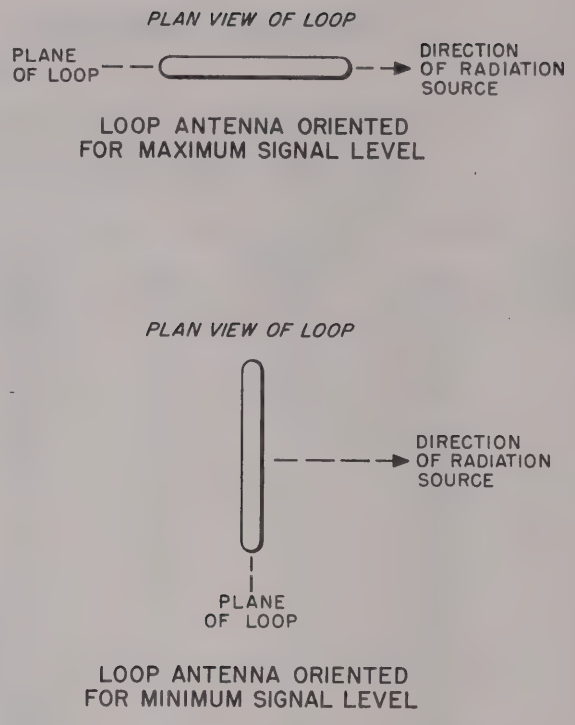


Figure 4-12. Directional Characteristics of Antenna AT-426/U (Loop Antenna)

Rotate the dipole exactly 90 degrees away from the null point, then make the measurement of the signal. This is required to give maximum signal input to the RI-FI Meter. If received signal is of mixed polarization, characterized by a poorly defined null point, any measurement of signal will be subjected to error.

c. USE OF VERTICAL ANTENNA.—A vertical antenna may be made from Antenna Base AB-364/U. This antenna is used as a self-resonant quarter-wave antenna in the frequency range 20 to 400 megacycles. See figure 4—11 and Chart No. 3 for illustration of vertical antenna adjustments. The end of Measuring Tape TL-635/U is attached to hook at the base of antenna and the length of the telescoping section is adjusted so the antenna tip corresponds to the operating frequency mark on the tape. To minimize error due to variations in soil conductivity, provisions are made for attaching a ground plane to the base. Vertical antenna correction factors provided in Chart No. 5 are based on the use of 24 copper wires 160 inches long attached to the antenna base and laid upon the ground, radiating evenly about the center. These wires are necessary when the antenna base is used on dry soil.

Field intensity measurements taken with a vertical antenna are subject to considerable error so include in the survey report a description of the site, topography, electrical properties of the ground, and the proximity of disturbing structures. Determine that only one cable is grounded in order to avoid a ground loop.

d. USE OF LOOP ANTENNA.—Antenna AT-426/U has a small diameter (three inches) because of the high

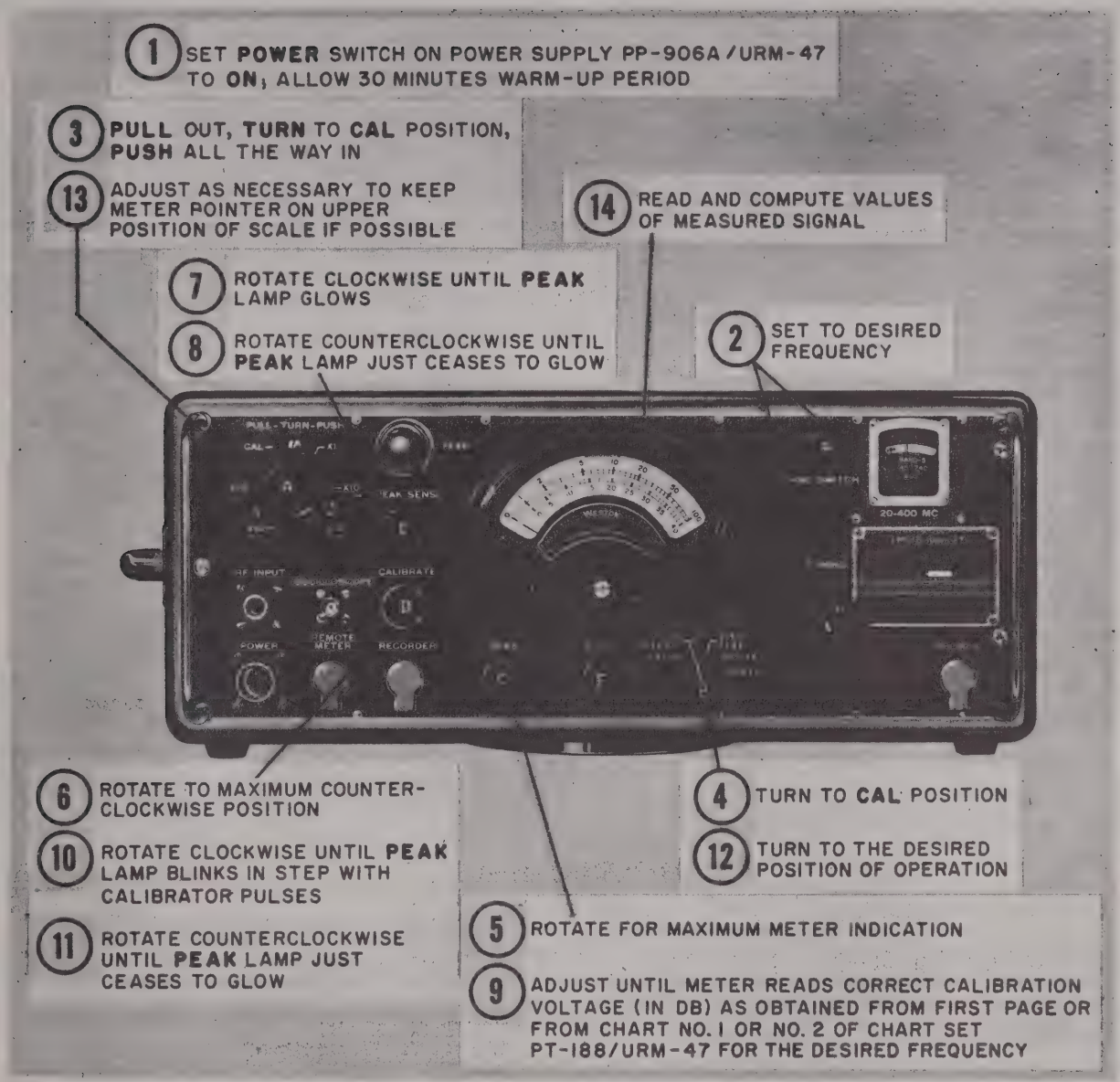


Figure 4-13. Radio Interference-Field Intensity Meter IM-88/URM-47, Simplified Operating Procedure

frequencies at which it is used. As it is small in size, it has been insulated so that it may be used as a hand-held loop probe for close proximity search of sources of radiation energy. It can also be mounted on the antenna masts using the loop base supplied.

The loop antenna is used for field intensity and radio interference measurements, that is, for determining the bearing of a signal source and then measuring the strength of the signal. The directional characteristics of a loop are illustrated in figure 4—12.

Step 1. When the signal being measured is properly tuned in, rotate the loop to obtain an aural null.

Note

When a sharp null cannot be obtained because the signal is very strong, adjust the attenuator control setting as necessary to reduce the signal. Sharpest nulls are obtained with highest feasible attenuator setting. In the presence of high acoustical noise at the survey site, use the indicating meter (M101) in conjunction with headphones to obtain the null indication.

Step 2. Upon obtaining the null indication, read the approximate magnetic bearing to the signal source,

as indicated by the azimuth pointer and azimuth dial. (See Section 3, paragraph 3-6. *b* for initial alignment of azimuth dial with respect to magnetic north.)

Note

For more precise bearing, correct the magnetic bearing for the degree of variation at the geographical location of the survey site. Bear in mind that bilateral bearings are obtained with this antenna. The ambiguity must be resolved by triangulation.

Step 3. Rotate the loop exactly 90 degrees away from the null point, then make the measurement of the signal. This is required to give maximum signal input to the RI-FI Meter.

Because of the small size of the loop and the frequencies involved, the loop correction factors provided for it in Chart No. 5 should be considered as approximate. If the received signal is other than vertically polarized, remove loop from mast adapter and rotate it in both vertical and horizontal planes for maximum reading. Approximate bearing readings, in this case, can best be done with a pocket compass. If received signal is of mixed polarization, characterized by a poorly defined null point, any reading will be subjected to error.

e. SIGNAL MEASUREMENT. *(See figure 4–13.)*

(1) STANDARDIZING GAIN.

Step 1. Turn POWER switch (S301) to ON. Set BAND SWITCH (G) and TUNING dial (H) to desired frequency.

Note

For best results, allow a 30-minute warm-up period after turning the power on. The power supply normally becomes warm during operation; do not regard it as an abnormal indication.

Step 2. Pull attenuator knob (A) out, turn to CAL position and push all the way in.

Note

The attenuator knob must always be pushed all the way in to avoid discontinuity at the coaxial connectors of the attenuator. Such discontinuity adversely affects the standing wave ratio and degrades the attenuation.

Step 3. Rotate function switch (B) to CAL position.

Step 4. Rotate PEAK control (C) to obtain approximately full-scale meter reading.

Step 5. Rotate CALIBRATE control (D) maximum counterclockwise.

Step 6. Adjust PEAK SENS. control (E) clockwise until PEAK indicator lamp glows, then rotate counterclockwise until the lamp just ceases to glow. The visual indication circuit is now at its most sensitive setting.

Step 7. Refer to the first page (introductory) of Chart Set PT-188/URM-47 (when measuring impulsive interference signals directly in terms of microvolts-per-kilocycle) or to Chart No. 1 or No. 2 (for all other measurements) and obtain the correct value of calibration voltage for standardizing at the desired frequency. This voltage is given in db. Adjust PEAK control (C) until indicating meter (M101) reads the correct calibration voltage on the decibel scale.

(Example: For a frequency of 27 megacycles, enter Chart No. 1 from the bottom at 27 megacycles on the Band 1 curve. (See sample Chart No. 1, figure 4–3.) Follow up to intersect the plotted curve. From the point of intersection, follow to the left to find the calibration setting to be used, in this case 34.4 db. Adjust PEAK control knob (C) until meter reads the correct calibrating voltage on the db scale, in this example 34.4 db.)

Step 8. Adjust the CALIBRATE control knob (D) clockwise until the PEAK indicator lamp blinks in step with calibrator pulses, then adjust counterclockwise until the indicator lamp just ceases to light. The RI-FI Meter gain is now standardized at this frequency. The CALIBRATE control (D) setting should not be changed until the RI-FI Meter is again standardized for gain at this or another frequency.

Note

Due to aging of tubes and other components, it may eventually become difficult at certain frequencies to calibrate the equipment properly using the figures given in the Chart Set because of insufficient CAL control range. In this case, it is still possible to calibrate the equipment quite accurately at reduced sensitivity. Accurate calibration is assured because of the constant output of the calibrator over long periods of time.

A new calibration figure (smaller than the original) may be arbitrarily selected. After making a measurement, the new calibration figure is simply subtracted from the figure given in the Chart Set and the difference applied to the meter reading of the signal under measurement. The procedure is as follows:

Rotate the CAL control fully clockwise.

Turn the PEAK control counterclockwise until the threshold is reached as indicated by flashing of the neon PEAK lamp.

Note the meter reading in db. This may be used as the new calibration figure.

Note the difference in db between this new calibration figure and that given on the calibration chart. Add this difference to the indicating meter reading of the signal.

For example, if the calibration figure is 25 db and this calibration cannot be made, rotate the PEAK control counterclockwise until the signal threshold is reached. Assume that at this point the indicating meter scale reads 20 db. Then, add 5 db to all signal measurements made at this frequency. Since signal measurements are usually read on the microvolt scale, the 5 db must be converted to a factor by which the microvolt reading can be multiplied. For example:
Assume a meter reading of 35 microvolts and a calibration setting difference of 5 db. The voltage ratio is:

$$5 \text{ db} = 1.78$$

Then, the corrected meter reading would be

$$1.78 \times 35 = 62.3 \text{ microvolts}$$

The db-voltage ratio relationship can be obtained from the conversion chart shown in figure 4–14.

Step 9. An alternate procedure for standardizing the gain of the RI-FI Meter is to use the "aural" method. Delete Steps 4, 5, and 6 above and use headphones to determine the point of signal cancellation by the "slide-back" bias (see subparagraph (2).(*b*), below). Because of variations in hearing ability between different operators, this method is not as consistent as the visual method. Also, this method cannot be used at locations where the acoustical noise level is high.

(2) PEAK OR "SLIDE-BACK" OPERATION.— For measurements of the peak value of random or impulsive interference, the "slide-back" VTVM circuit is used.

Note

This equipment has been calibrated in terms of RMS of a sine wave (0.707 of true peak of a sine wave). The FI, QP and PEAK functions are adjusted to provide the same reading on an unmodulated sine wave signal. Peak values, hereafter referred to as effective peak values, are therefore in terms of RMS of a sine wave which would have the same peak amplitude as the signal that appears at the second detector input. Either visual or aural method can be used for measuring the signal.

First standardize the gain of the equipment at the test frequency as described in Steps 1 through 8 in subparagraph (1) above, then proceed as outlined below.

(*a*) VISUAL METHOD OF MEASUREMENT.

Step 1. Turn function switch (B) to PEAK.

Step 2. Turn PEAK control (C) to obtain approximately full-scale meter reading.

Step 3. Adjust attenuator (A) to CAL position by means of the PULL-TURN-PUSH sequence.

Step 4. Turn PEAK SENS. control (E) clockwise until PEAK indicator lamp glows, then rotate counterclockwise until the lamp just ceases to light. The visual indicating circuit is now at its most sensitive setting.

Step 5. Adjust attenuator control (A) by a PULL-TURN-PUSH sequence to select appropriate attenuation that results in a final meter reading in the upper portion of scale where practicable.

Step 6. Turn PEAK control (C) counterclockwise until PEAK indicator lamp glows or blinks with signal modulation, then rotate clockwise until lamp just ceases to glow. Do not advance the PEAK control (C) beyond the threshold point or an erroneous meter indication will result. Observe the pointer of the indicating meter as the threshold point is approached. If the pointer goes off scale, advance the attenuator control (A) to next higher position and then readjust the PEAK control (C) to determine the threshold point.

Note

Take into account the slight delay in final meter (M101) indication after operation of the PEAK control.

Step 7. Read the indicating meter.

(*b*) AURAL METHOD OF MEASUREMENT.

Step 1. Turn function switch (B) to PEAK.

Step 2. Turn PEAK SENS. control (E) completely counterclockwise.

Step 3. Turn PEAK control (C) completely counterclockwise.

Step 4. Adjust position of attenuator control (A) by a PULL-TURN-PUSH sequence to select appropriate attenuation that results in a final meter reading in the upper portion of the scale where practicable.

Step 5. Adjust the AUDIO control (F) for a convenient headphone signal level. Slowly turn the PEAK control (C) clockwise until the received headphone signal just becomes inaudible. If necessary, advance AUDIO control (F) to a high level to facilitate establishment of this threshold point. Do not advance the PEAK control (C) beyond the point of inaudibility, or an erroneous meter indication will result. Observe the pointer of the indicating meter as the point of inaudibility is approached. If the pointer goes off scale, return PEAK control (C) to its fully counterclockwise position and advance the attenuator control to the next higher position. Then repeat the adjustment of PEAK and AUDIO controls to determine the point of inaudibility.

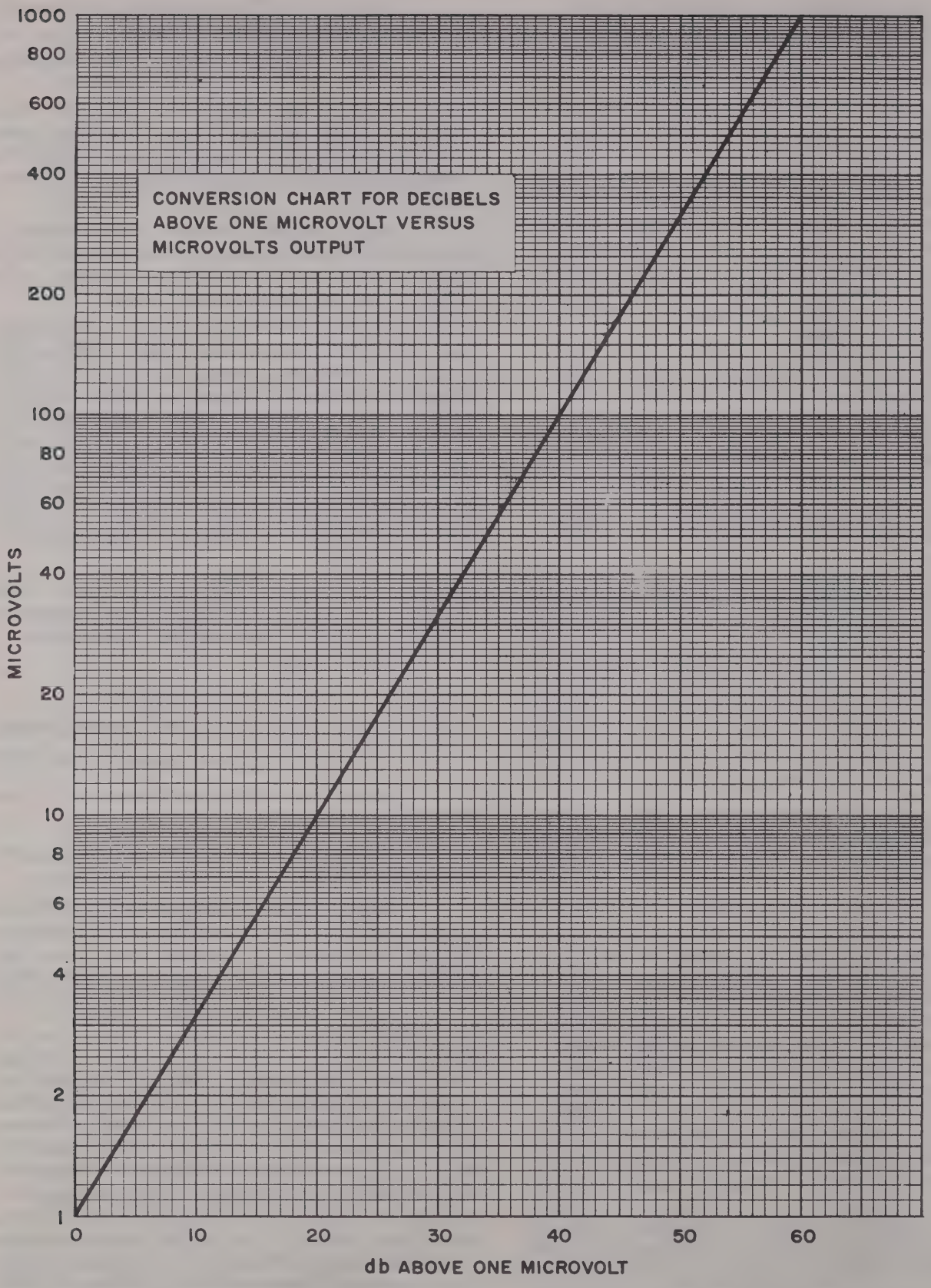


Figure 4-14. Conversion Chart for Decibels Above One Microvolt vs. Microvolts Output

Note

Take into account the slight delay in final meter (M101) indication after operation of the PEAK control.

Step 6. Read the indicating meter.

(3) MEASURING SINE WAVE SIGNALS.

Step 1. Standardize the equipment gain at the test frequency as described in Steps 1 through 8 of subparagraph (1) above. Use CALIBRATION SETTINGS from Chart No. 1 or No. 2.

Step 2. Turn function switch (B) to FI for an RMS reading of a c-w signal or to QP or PEAK when carrier plus modulation is to be measured.

Step 3. Adjust position of the attenuator control (A) by the PULL-TURN-PUSH sequence until meter reads within meter scale range, preferably in the upper portion of the meter scale. Tune c-w signals for maximum meter reading.

Note

The signal should be close to the frequency of gain standardization, otherwise it will be necessary to standardize the gain at the new frequency before a measurement can be accurately made.

Step 4. Read the indicating meter in microvolts. Compute the value of the measured signal according to measuring modes given below.

(*a*) TWO-TERMINAL VOLTMETER.—Multiply the meter reading by correction factor from Chart No. 1 or No. 2 (No. 1 for first four bands, other factors for bands 5 and 6 depending on sensitivity). Multiply the product by the attenuator control setting.

(Example: Assume attenuator control setting is $X10^2$, meter scale indication is 20 microvolts and correction factor is 1. Then, $20 \times 1 \times 10^2 = 2000$ microvolts across 50 ohms.)

(*b*) DIPOLE, LOOP, OR VERTICAL ANTENNA USED.—When a dipole, loop or vertical antenna is used, multiply the meter reading in microvolts by the correction factor from Chart No. 1 or No. 2. Multiply this product by the appropriate antenna factor on Chart No. 4 or No. 5. Multiply this product by the attenuator control setting.

(Example 1: Assume tuned dipole antenna is used, attenuator control setting is $X10^3$, meter scale indication is 70 microvolts and frequency is 60 megacycles. Refer to sample Chart No. 4 (figure 4—5) for tuned dipole factors. Enter chart from the bottom at 60 megacycles, follow up to intersect the plotted curve. From the point of intersection, follow to the left to find the dipole factor to be used, in this case 3.05. The correction factor for Band 3 from sample Chart No. 1 (figure 4—3) is 1. Then, $70 \times 1 \times 3.05 \times 10^3 = 213{,}500$ microvolts-per-meter.)

(Example 2: Assume vertical antenna in use, attenuator control setting is $X10^2$, meter scale indication is 40 microvolts and frequency is 180 megacycles. We find that the vertical antenna factor from sample Chart No. 5 (figure 4—5) for 180 megacycles is 10.0. The correction factor for Band 5 is 2. Then, $40 \times 2 \times 10 \times 10^2 = 80{,}000$ microvolts-per-meter.)

(4) MEASURING SINE WAVE SIGNALS WITH HIGH AMBIENT INTERFERENCE.—When a sine wave signal is being measured in the presence of high ambient interference of random nature, it is possible to correct for the interference and determine the actual intensity of the signal as though the random interference were not present. First, obtain the value of interference and signal combined. Then, obtain the value of the ambient interference only. This measurement may be obtained by turning off the signal, if possible, or detuning the RI-FI Meter slightly. Monitor with headphones to determine how far to detune. When using the FIELD INTENSITY function, the step procedure is as follows:

Step 1. Standardize the gain of the equipment.

Step 2. Set function switch to FI position.

Step 3. Note the meter reading of the random interference in the absence of signal. If necessary, detune slightly off signal.

Step 4. Tune in signal and note meter reading of signal and random interference combined.

Step 5. In sample Chart No. 8 (figure 4—7) locate the meter reading of "interference plus signal" on horizontal scale of chart.

(Example: Assume 55 microvolts.)

Step 6. Follow the arc upward until it intersects the horizontal line which represents the "interference only" meter reading.

(Example: Assume 34 microvolts.)

Step 7. Drop down from the point of intersection to the horizontal scale and read off the corrected meter reading. This is the value of the signal in the absence of the random interference.

(Example: 43 microvolts.)

Step 8. When using the QUASI PEAK function, subtract the value of "interference only" obtained in Step 6 above directly from the value of interference and signal combined. (See Interference Plus Signal Chart, paragraph 4-7.*b*.(3).*(d)*.)

(5) MEASURING RANDOM INTERFERENCE.

Step 1. Standardize the equipment gain at the test frequency as described in Steps 1 through 8 of subparagraph (1) above. Use CALIBRATION SETTINGS from Chart No. 1 or No. 2.

Step 2. Rotate function switch (B) to FI for an equivalent RMS reading of random interference, to QP

for a "nuisance" value reading, and to PEAK for a peak value reading.

Step 3. Adjust position of the attenuator control (A) by the PULL-TURN-PUSH sequence until meter reads within the meter scale range, preferably in the upper portion of the meter scale.

Step 4. Read indicating meter in microvolts. Compute the value of the measured signal in the same manner as in subparagraphs (3).*(a)* and (3).*(b)* above for sine wave signals.

Step 5. To obtain per-kilocycle values, divide the computed values obtained by Step 4 above by the square root of the effective "random interference" bandwidth. Refer to Charts No. 6 and No. 7 for the bandwidth data. The square root can be read directly from the top of Chart No. 9.

(Example 1: Assume attenuator setting is X10, meter scale indication is 35 microvolts, correction factor is 1, and the effective "random interference" bandwidth is 132 kc. Refer to sample Chart No. 9 (figure 4—8). Enter chart on upper scale at 132 kc. The square root value of 11.5 will be found directly below on the lower scale. Then:

$$\frac{10 \times 35 \times 1}{11.5} = 30.43$$ *microvolts-per-meter-per-kilocycle across 50 ohms.)*

(Example 2: Assume a tuned dipole in use, attenuator control setting is X10², meter scale indication is 70 microvolts, and frequency is 116 megacycles. We find that the antenna factor from sample Chart No. 4 for 116 megacycles is 3.1. The correction factor for Band 4 is 1. The effective "random interference" bandwidth from sample Chart No. 7 for 116 megacycles is 116 kilocycles. From Chart No. 9, the square root of 116 is 10.77. Then:

$$\frac{10^2 \times 70 \times 1 \times 3.1}{10.77} = 2014.9$$ *microvolts-per-meter-per-kilocycle.)*

(6) MEASURING IMPULSIVE INTERFERENCE SIGNALS.—Two methods of impulsive interference signal measurements are available to the operator of the AN/URM-47A. The method described first gives the final peak value of a conducted signal in microvolts-per-kilocycle across 50 ohms. The second method presents the final peak value in decibels above one microvolt-per-megacycle across 50 ohms.

(a) METHOD NO. 1.

Step 1. Standardize the equipment gain at the test frequency as described in Steps 1 through 8 of subparagraph (1) above. Use the CALIBRATION SETTING given on the first introductory page of the Chart Set. This setting is in db and is for use with Cable Assembly CG-92D/U (20′ 0″).

Step 2. Take a PEAK or "slide-back" measurement of the impulsive interference signal. Use either visual or aural method of measurement. This meter reading is equivalent to a bias voltage (introduced by the PEAK control) that is identical to the effective peak value of the input signal as seen by the second detector.

Step 3. For conducted measurements, mentally *divide* the indicated reading (meter scale reading times the attenuator setting) by a *bandwidth* factor of 100 to obtain the final peak value (see note in subparagraph (2) above) of conducted signal in microvolts-per-kilocycle across 50 ohms.

Note

The amplitude of a pulse signal that appears at the second detector is directly proportional to the effective impulsive interference bandwidth. To the closest decimal point, the bandwidth of the equipment is 100 times greater than 1 kc.

Step 4. When measuring field intensity with a pickup device, mentally *divide* the indicated meter reading (meter scale reading times the attenuator setting) by a bandwidth factor of 100 to obtain a value of microvolts-per-kilocycle. Multiply this quantity by the appropriate antenna factor from Charts No. 4 and No. 5. This result will be the final peak value (see note in subparagraph 4-4.*e.*(2) above) of field intensity in microvolts-per-meter-per-kilocycle.

Step 5. When using the CALIBRATION SETTINGS provided on Charts No. 1 and No. 2, the r-f cable losses are compensated. With a single CALIBRATION SETTING, obtained from the first page of Chart Set PT-188/URM-47, the r-f cable losses are compensated for at only one frequency, 125 megacycles. A maximum error of four per cent occurs at either end of the frequency range. If greater accuracy is desired, r-f cable losses must be taken into account. Multiply the final values of Steps 3 and 4 above by the appropriate correction factor from Chart No. 9 (see figure 4—8) to obtain final corrected values. When using a short r-f cable, no correction for attenuation losses is necessary. However, a calibration setting 0.5 db less than that appearing on the first page of the Chart Set must be used.

(Example 1: Assume a fixed-length dipole in use, attenuator control setting is X10, correction factor is 1, frequency is 26 megacycles, and meter indication is 40 microvolts. From sample Chart No. 5 (figure 4—5), the fixed length dipole factor is 2.9. Then:

$$\frac{10 \times 1 \times 40 \times 2.9}{100} = 11.6$$ *microvolts-per-meter-per-kilocycle.*

For greater accuracy when using Cable Assembly CG-92D/U (20′ 0″), multiply by the correction factor from Chart No. 9 (figure 4—8). Enter chart from the bottom at 26 megacycles, follow up to

intersect the plotted curve. From point of intersection, follow to the left to find the correction factor to be used, in this case 0.963. Then:

$$11.6 \times 0.963 = 11.17$$ *microvolts-per-meter-per-kilocycle.)*

(Example 2: Assume a loop antenna in use, attenuator control setting is X10², frequency is 330 megacycles and a meter indication of 70 microvolts. The correction factor for Band 6, at 330 megacycles, from sample Chart No. 2 (figure 4–3) is 3.5. From sample Chart No. 5 (figure 4–5), the loop antenna factor is 120. Then:

$$\frac{100 \times 70 \times 3.5 \times 120}{100} = 29{,}400$$ *microvolts-per-meter-per-kilocycle.*

For greater accuracy when using Cable Assembly CG-92D/U (20′ 0″), multiply by the correction factor for cable loss. From sample Chart No. 9 (figure 4–8), the corrected factor is 1.0341. Then:

$$29{,}400 \times 1.0341 = 30{,}605$$ *microvolts-per-meter-per-kilocycle.)*

(b) METHOD NO. 2.

Step 1. Standardize the equipment gain at the test frequency as described in Steps 1 through 8 of subparagraph (1) above. Use the CALIBRATION SETTING given on the first page of the Chart Set. This setting is in db and is for use with Cable Assembly CG-92D/U (20′ 0″).

Step 2. Take a PEAK or "slide-back" measurement of the impulse noise signal. Use either visual or aural method of measurement. This meter reading is equivalent to a bias voltage (introduced by the PEAK control) that is identical to the effective peak value of the input signal as seen by the second detector.

Step 3. For conductive measurements, mentally add 20 db to the indicated reading (meter reading in db plus the attenuator setting in db) to obtain the final peak value of conducted signal in db above one microvolt-per-megacycle across 50 ohms.

Note

The amplitude of a pulse signal that appears at the second detector is directly proportional to the impulse noise bandwidth. To the closest decimal point, the bandwidth of the AN/URM-47A equipment is 1/10 megacycle.

Step 4. When measuring field intensity with a pickup device, mentally add 20 db to the indicated reading (meter scale reading in db plus attenuator setting in db) to obtain a value of db above 1 microvolt-per-megacycle. Add to this quantity the appropriate db equivalent of the antenna factor. This may be obtained by applying the factor taken from Charts No. 4 and No. 5 to the conversion chart (see figure 4–13). This result will be the final peak value of field intensity in db above 1 microvolt-per-megacycle-per-meter.

Step 5. When using a 20-foot r-f cable and the CALIBRATION SETTING on page one of the Chart Set, the cable attenuation is only compensated for at 125 megacycles. A maximum error of 4 per cent occurs at either end of the frequency range. If greater accuracy is desired, these r-f cable losses must be taken into account. Add to the final values of Steps 3 and 4 above the appropriate correction in db from Chart No. 9 (see figure 4–8) to obtain final corrected values. When using a short r-f cable, no correction for attenuation losses is necessary. However, a calibration setting of 0.5 db less than that appearing on the first page of the Chart Set must be used.

(Example 1: As a two-terminal voltmeter, assume a meter scale reading of 32 db, an attenuator setting of +40 db, and a frequency of 200 megacycles. Then the conducted signal will be:

$$32\ db + 40\ db + 20\ db = 92\ db$$ *above 1 microvolt-per-megacycle across 50 ohms.*

For greater accuracy when using Cable Assembly CG-92D/U (20′ 0″), add correction in db from Chart No. 9 (see figure 4–8). Enter chart from the bottom at 200 megacycles; follow up to intersect the plotted curve. From point of intersection with curve, follow to the right to find the correction in db to be used, in this case 0.14, then:

$$92\ db + 0.14\ db = 92.14\ db$$ *above 1 microvolt-per-megacycle across 50 ohms.)*

(Example 2: Assume a tuned dipole antenna in use, a frequency of 65 megacycles, a meter scale reading of 37 db, and an attenuator setting of +20 db. Then:

$$37\ db + 20\ db + 20\ db = 77\ db$$ *above 1 microvolt-per-megacycle.*

From Chart No. 4, the antenna factor is 3.3; this in db is 10.4 (see conversion chart, figure 4–14). Then the field intensity will be:

$$77\ db + 10.4\ db = 87.4\ db$$ *above 1 microvolt-per-meter-per-megacycle.*

For greater accuracy when using the 20-foot r-f cable, add correction in db from Chart No. 9 (see figure 4–8), thus:

$$87.4\ db - 0.18\ db = 87.22\ db$$ *above 1 microvolt-per-meter-per-megacycle.)*

f. VISUAL MONITORING OF SIGNAL.—Visual observation of interference signals and modulation components can be made by connecting an oscilloscope to receptacle J107. Use Cable Assembly CG-573/U (3′ 0″). The equipment is capable of an overall frequency response of 20 to 100,000 cycles within ±3 db. This includes the input capacitance of the oscilloscope if not too high. For best results, use the FIELD INTENSITY position of the function switch (B). Rotate the AUDIO control (F) to its maximum counterclockwise position. This position removes V114 grid loading from the plate circuit of V113 and improves the high-frequency response of the signal available at receptacle J107.

Note

An oscilloscope, such as the OS-8/U or equivalent, can be used in the FIELD INTENSITY and PEAK function switch positions. In the FIELD INTENSITY position, the oscilloscope is used for observing the modulation envelope of continuous wave signals or of radio interference. It can also be used to determine the repetition rate of pulse-type interference. In the PEAK position, the oscilloscope can be used as a visual null indicator when used in conjunction with the PEAK control.

4-5. SUMMARY OF OPERATION.

This summary of Radio Interference Measuring Set AN/URM-47A operation is the same as that given on the first two introductory sheets of Chart Set PT-188/URM-47. This Chart Set is normally carried inside the panel-protective cover on the Radio Interference-Field Intensity Meter IM-88/URM-47. An extra Chart Set is provided inside the metering unit.

a. The word "signal" is used to designate any r-f input to the equipment, i.e., sine wave, random interference or impulsive interference. Signal inputs to the equipment are of two types. The first includes the use of the equipment as a two-terminal voltmeter, in making conducted measurements, by direct connection of the 20-foot r-f input line to a 50-ohm coaxial circuit. Conductive measurements on lines carrying a-c or d-c voltages up to 1000 volts peak may be made. If impedances other than 50 ohms are connected to the input, the meter readings will be relative, not actual, values.

The second type input is as a field intensity meter using dipole, rod, or loop antennas as calibrated pickup devices. Field intensity measurements are made with antenna rotated for maximum response in the plane of polarization desired. Adjust antenna length within $\pm 1/8$ in. of calibration on frequency measuring tape for most accurate results. (See Chart No. 3.)

The information presented in the Chart Set is valid only when measurements are taken using the 20-foot r-f transmission line CG-92D/U. On conductive measurements it is assumed that the device being tested presents a carefully matched 50-ohm input to the equipment.

b. ADJUSTING EQUIPMENT FOR STANDARD GAIN.

Step 1. Set BAND switch (G) and TUNING dial (H) to desired frequency.

Step 2. PULL attenuator knob (A) out, TURN to CAL position, PUSH all the way in.

Step 3. Rotate FUNCTION switch (B) to CAL.

Step 4. Rotate PEAK control (C) to obtain approximate full peak meter reading.

Step 5. Rotate CAL control (D) maximum counterclockwise.

Step 6. Adjust PEAK SENS. control (E) clockwise until PEAK indicator lamp glows, then rotate counterclockwise until the lamp just ceases to light.

Step 7. Rotate PEAK control (C) for an output meter indication equal to the CALIBRATION SETTING for the desired frequency as provided on Charts No. 1 and No. 2. When measuring impulsive interference directly in terms of microvolts-per-kilocycle, use a CALIBRATION SETTING of____db throughout the frequency range.

Step 8. Adjust CAL control (D) clockwise until PEAK indicator lamp blinks in step with calibrator pulses, then adjust counterclockwise until lamp just ceases to light.

Step 9. The equipment is now adjusted for standard gain. The CAL control (D) setting should not be changed until the RI-FI Meter is again standardized for gain at this or another frequency.

c. PEAK OR "SLIDE-BACK" OPERATION.

Step 1. PULL-TURN-PUSH attenuator knob (A) to CAL position.

Step 2. Rotate function switch (B) to PEAK.

Step 3. Rotate PEAK control (C) to obtain approximate full scale meter reading.

Step 4. Adjust PEAK SENS. control (E) clockwise until PEAK indicator lamp glows, then slowly rotate counterclockwise until the lamp just ceases to light.

Step 5. PULL-TURN-PUSH attenuator knob (A) to appropriate step (X1 through $X10^4$).

Step 6. Slowly adjust PEAK control (C) until interference just ceases to be visible on the lamp. Adjust attenuator as required. Adjust PEAK control carefully back and forth at the threshold point for improved accuracy. Take into account the slight lag in the effect of the control. The meter reads a bias (introduced by the PEAK control) which is identical to the peak value of the signal.

Note

This equipment has been calibrated in terms of RMS of a sine wave (0.707 of true peak of a sine wave). Peak values are therefore in terms of RMS of a sine wave which would have the same peak amplitude as the signal that appears at the second detector input.

d. MEASURING SINE WAVE SIGNALS.

Step 1. Standardize the gain of the equipment at the desired frequency.

Step 2. Rotate FUNCTION switch (B) to FI for an RMS reading of c-w signals or to QP or PEAK when carrier plus modulation is to be measured.

Step 3. PULL-TURN-PUSH attenuator knob (A) to select appropriate attenuation for meter reading in upper portion of the scale, where possible.

Step 4. Multiply meter reading in microvolts by an appropriate correction factor from Charts No. 1 and No. 2. Where a pickup device is used, multiply the corrected meter reading by appropriate antenna factor from Charts No. 4 and No. 5. Multiply the result by attenuator setting to obtain final corrected values.

Step 5. When a sine wave signal is being measured in the FI function in the presence of high ambient interference of random nature, it is possible to correct for the interference and determine the actual value of the signal as though interference were not present. Refer to Chart No. 8. Also refer to Noise Plus Signal Chart, Section 4.

e. MEASURING RANDOM NOISE SIGNALS.

Step 1. Standardize the gain of the equipment at the desired frequency.

Step 2. Rotate FUNCTION switch (B) to FI for an equivalent RMS reading of a random noise signal, to QP for a "nuisance" value reading, and to PEAK for a peak value reading (see note, subparagraph *c* above).

Step 3. PULL-TURN-PUSH attenuator knob (A) to select appropriate attenuation for meter reading in upper portion of the scale, where possible.

Step 4. Multiply meter reading in microvolts by appropriate correction factor from Charts No. 1 and No. 2. Where a pickup device is used, multiply the corrected meter reading by appropriate antenna factor from Charts No. 4 and No. 5. Multiply the result by attenuator setting to obtain final corrected values.

Step 5. To obtain per-kilocycle values, divide corrected values from Step 4 by the square root of the random noise bandwidth. Refer to Charts No. 6 and No. 7 for bandwidth data. The square root can be read directly at the top of Chart No. 9.

f. MEASURING IMPULSE NOISE SIGNALS.

(1) METHOD NO. 1.

Step 1. Standardize the gain of the equipment at the desired frequency.

Step 2. Readjust PEAK SENS. control (E), if required.

(*a*) Adjust attenuator knob (A) to CAL position. Rotate FUNCTION switch (B) to peak position.

(*b*) Rotate PEAK control (C) to obtain approximate full scale meter reading.

(*c*) Adjust PEAK SENS. control (E) clockwise until PEAK indicator lamp glows, then slowly rotate counterclockwise until lamp just ceases to light.

Step 3. PULL-TURN-PUSH attenuator knob (A) to appropriate step (X1 through X10).

Step 4. Slowly adjust PEAK control (C) until interference just ceases to be visible on the lamp or heard in the headphones. Adjust attenuator as required. Adjust PEAK control carefully back and forth at the threshold point for improved accuracy.

Step 5. For conductive measurements, multiply the meter reading in microvolts by the attenuator setting and divide by 100 to obtain peak value in microvolts-per-kilocycle (see note, subparagraph *c* above).

Step 6. Where a pickup device is used, multiply the meter reading in microvolts by the attenuator setting and by the appropriate antenna factor from Charts No. 4 and No. 5. Divide the result by 100 to obtain final peak values (see note, subparagraph *c* above) in microvolts-per-meter-per-kilocycle.

Step 7. If greater accuracy is desired, r-f cable losses must be taken into account. Multiply the final values of Steps 5 and 6 by the appropriate correction factor from Chart No. 9 to obtain final corrected values.

(2) METHOD NO. 2.

Step 1. Standardize the gain of the equipment at the desired frequency.

Step 2. Readjust PEAK SENS. control (E), if required.

(*a*) Leave attenuator knob (A) in CAL position. Rotate function switch to PEAK position.

(*b*) Rotate PEAK control (C) to obtain approximate full scale meter reading.

(*c*) Adjust PEAK SENS. control (E) clockwise until PEAK indicator lamp glows, then slowly rotate counterclockwise until the lamp just ceases to light.

Step 3. PULL-TURN-PUSH attenuator knob (A) to appropriate step (0 through +80 db).

Step 4. Slowly adjust PEAK control (C) until interference just ceases to be visible on lamp or heard in headphones. Adjust attenuator as required. Adjust PEAK control carefully back and forth at the threshold point for improved accuracy.

Step 5. For conductive measurements, add 20 db to the meter scale reading in db plus the attenuator setting in db to obtain final peak value of conducted signal in db above 1 microvolt-per-megacycle.

4-6. USE AS A SENSITIVE TWO-TERMINAL RADIO FREQUENCY VOLTMETER.

Radio Interference-Field Intensity Meter IM-88/URM-47 is a selective highly-sensitive two-terminal voltmeter. By considering the applications carefully it can be used as listed below:

a. It can be used as a null instrument in conjunction with r-f bridges and slotted lines suitable for operation in the 20- to 400-megacycle frequency range. Extremely short leads, preferably shielded, must be used and

extreme care must be taken to assure proper impedance matches.

b. It can be used to measure the gain of a radio-frequency stage in radio equipment by measuring the voltage input to the stage and the signal output of the stage. It should be noted that the RI-FI Meter shunts approximately 50 ohms across the circuit and may upset the stage under test unless appropriately isolated.

c. It can be used to check the voltage of any 50-ohm transmission line up to one volt, provided the transmission line is properly terminated.

Note

The voltage rating (d-c or a-c power frequencies) that may be applied to the input without damage to input circuits is 1000 volts.

d. It can be used to determine the loss in a coaxial line connected to a signal generator by comparing the signal level at the input and output ends of the line. The appropriate impedance matching network must be used between the line and the RI-FI Meter. To minimize the effects of standing waves, the higher attenuator positions of $X10^2$, $X10^3$, and $X10^4$ should be used when practicable.

4-7 SURVEY CONSIDERATIONS.

a. FIELD INTENSITY CONSIDERATIONS.—A knowledge of the fundamentals of wave propagation is essential in order to conduct field intensity surveys properly. The study of wave propagation is highly complicated by the large number of variable factors that must be considered and by the interpretation of the results of a series of measurements. This section of the instruction book contains a brief description of some of these factors as they apply to the frequency range covered by Radio Interference Measuring Set AN/URM-47A.

To secure meaningful and interpretable results, a field intensity survey must be well planned. The necessary schedules should be arranged and coordinated with all participating units and personnel well in advance of the date of the tests. Adequate spare parts and supplies should be available, especially if the project is such that it may be impossible to obtain repeat transmissions. It is a good plan to carry duplicate equipments for such a project, when possible.

If measurements are to be continued away from the base station over a period of several days, a check-off list of accessories to be taken along should be carefully prepared. Such a list would include items such as data sheets, recorders, recorder charts and ink, pencils, flash lamps, spare batteries, wire, electronic repair kit, multimeter, battery clips, road maps, topographical charts, compass, slide rule, thermos bottles, adequate clothing, sleeping facilities, toilet articles, first aid kit, paper towels, hand axe, power supply spares, necessary accessories and spares for the vehicle, arrangements for obtaining gas and oil, spare vehicle keys, food and water, etc.

Because of the difference in the manner in which field intensity surveys and radio interference surveys are conducted, each will be treated separately.

(1) SELECTING THE SITE FOR FIELD INTENSITY MEASUREMENTS.—It is sometimes necessary to make field intensity measurements at a designated location, and it is then essential to consider the effect of surrounding objects on the received signal strength. Often, however, the measurement location can be selected, and the observer must then know what constitutes a good site for a given set of conditions. True radiation field measurements are made at distances greater than about two wavelengths from the transmitter in order to avoid the influence of the induction field.

In selecting a site for field intensity measurement, the following considerations should be kept in mind: The radio-frequency voltage induced in a receiving antenna is proportional to the intensity of the electromagnetic field in the space occupied by the antenna. The intensity at this point will depend upon the radiated power; the frequency of the received signal; the distance from the transmitter; the attenuation over the path between the transmitter and the receiver; reflections and reradiations from nearby conductors, such as power lines, wire fences, and steel buildings; absorption by trees; and the effects of hill, gullies, or cliffs.

The ideal site would be an open, flat terrain at a considerable distance (1000 feet of more) from buildings, electric lines, fences, etc. Ideal sites are rare in the more populated sections of the country; therefore, it is good practice to check a proposed location by making measurements of the desired signal at several points in the vicinity. If the same value of field intensity is obtained at each of the points any one may be considered satisfactory. If it is necessary to use an unsatisfactory site, a series of readings should be recorded at a number of different points in the neighborhood of the selected site, and detailed notes on the site conditions should be appended to the recorded data.

There are no fixed rules to govern the minimum distance between the field intensity measuring equipment and the nearest wire lines or other disturbing object because possible resonances are unpredictable. Another consideration in site selection is the possible presence of local electrical interference sources which may make field intensity measurements difficult.

If measurements are to be made with the equipment mounted in a vehicle, it will be necessary to determine the effect of the vehicle on the received signal. This is done by measuring a signal with the equipment mounted in the vehicle as it is to be used and again with it temporarily located some distance away from the vehicle. If differences are noted, measurements should be taken with the vehicle heading changed 15 or 20 degrees at a time. The differences between the readings taken in the vehicle and those taken outside the vehicle are then plotted in percentages of the outside readings versus heading. A different curve will generally be needed for each operating frequency. A calibration of

this type is facilitated by simultaneously using two similar equipments, one equipment set up in the open and the other mounted in the vehicle and operated 50 to 75 feet away from the former.

(2) PROPAGATION CHARACTERISTICS FOR HIGH FREQUENCIES AND ULTRA-HIGH FREQUENCIES.—The propagation description will be presented in two parts: *(a)* for frequency range where sky-wave energy is reflected back to earth (20 to 35 megacycles); and (*b*) for frequency range where no sky-wave energy is reflected back to earth (above 35 megacycles).

(*a*) The relationship of the "sky wave" and the "ground wave" and the factors affecting them are discussed briefly below.

When measuring field intensities at high frequencies, there are two major factors to consider. The more important of these factors is the distance of the measuring site from the transmitting antenna. There is an area wherein the ground wave of the transmitting antenna is too weak to be detected and the sky wave is not present, dependent upon the angle of radiation from transmitting antenna and the angle of reflection of the transmitted signal from the ionosphere. This area, at a distance from the transmitting station, depending upon the transmitting frequency, is called the "skip distance". The extent of this area is dependent to a great degree upon the conditions of the ionosphere at the time of measurement. Therefore, *the distance of the recording site from the transmitting antenna and the exact time of measurements are very important.*

The next factor of importance is the varying conditions due to ionospheric changes and is described by a condition which is known as night and dawn effect. This effect is due, primarily, to changes in the ionosphere. At, or shortly after sunset, and just before dawn, considerable changes occur in the ionosphere. It is due to these disturbances that large variations in measured field intensities occur. The higher the frequencies, the greater the effect of these disturbances.

Abnormal propagation conditions may be attributed to magnetic or ionospheric storms. During ionospheric storms, the high frequencies are subject to very erratic changes and a large part of the spectrum above 2000 kilocycles may be entirely "blacked out". Abnormal propagation conditions cause the measured field intensity values to be higher or lower than would be obtained under normal conditions. An alert operator should be able to recognize these abnormal conditions so that proper notes may be entered in the measurement data.

(*b*) Propagation of high-frequency waves above 35 megacycles is similar to propagation of light waves in that the transmission is line-of-sight and is affected by reflection and refraction. In general, the receiving antenna must be in an unobstructed line with the transmitting antenna.

If a transmission path lies near a reflecting surface, the energy picked up by the receiver antenna is made up of two components, one received directly from the transmitter antenna and the second reflected from the earth. The resultant of the direct and the reflected wave will depend not only on the difference in the length of the two paths but upon changes of phase or intensity introduced in the process of reflection. These phase or intensity changes result in breaking up the transmitted energy pattern into a lobe structure (not to be confused with polar plot of antenna directional characteristics). The longer the wavelength, the higher the lowest lobe is tilted upward from the surface of the earth. Hence, the energy received in an aircraft will be determined by its position relative to the maximum and minimum points of the lobe pattern.

Transmission in these frequencies is affected by refraction, the refraction resulting from vertical temperature gradients. For example, when land is heated by the sun and cools by radiation at night, a thin layer of dense cool air is formed just above the ground, resulting in a rapid decrease of refractive index with height. Refraction causes the transmitted wave to bend slightly in conformation with the contour of the earth.

A more widespread cause of strong vertical gradients in refraction index, and therefore of excessive bending of transmitted energy, is the refractive effect of water vapor. Over most of the surface of the ocean, the region above the water is not saturated with water vapor, whereas the layer directly in contact with the water must be very nearly saturated. There is a continual evaporation of water from the sea and a diffusion of the vapor upward into the overlying air mass. Thus, there exists a vertical gradient in the concentration of water vapor with the highest concentration at the surface and decreasing upward. This tends to form a duct in which the transmitted wave curves to follow a direct path as if it were enclosed in a huge waveguide.

The average or standard refraction effect of the atmosphere may be taken into account by assuming that the earth has a radius 4/3 times its actual value, and by computing geometrical horizon ranges on this assumption. When this is done the horizon will be at a distance (r) from a point at height (h) above a spherical earth given by

$$r = 1.22 \sqrt{h}$$

where (h) is in feet and (r) is in nautical miles; or by

$$R = \sqrt{2h}$$

where (R) is in land miles and (h) in feet.

The radio horizon distance between a point at (h_1), and another at height (h_2) is

$$r = 1.22 \sqrt{h_1} + 1.22 \sqrt{h_2}$$

The importance of antenna elevation for line-of-sight transmission in this frequency band is emphasized by the square root dependence in the above formula.

(3) RECORDING OF OBSERVED DATA.—In addition to correct operating procedures described elsewhere in this instruction book, it is essential that data records be very complete so that the results of a survey

may be properly interpreted and evaluated by interested personnel.

When graphic records are made, each recorder chart must be carefully identified and complete information supplied for each series of measurements. This information should include the date, start and finish time, the test identification, the location (very carefully described as to geographical position and to presence of disturbing objects), description of weather conditions, the equipment used, the measurement frequency, the calibration, the attenuator setting, the function switch position, the antenna used, the chart speed, erratic conditions, and non-opposite minima. A convenient form for entering data on a recorder chart is as follows:

Date_____

TEST_____

LOCATION_____

_____(use additional space for complete

description)_____

Equipment _____ Ser. #_____

Freq. _____Calibration _____

Atten. Setting _____Function-sw _____

Antenna_____

Height above ground_____

Ground_____

Recorder Ser. #_____Chart speed_____

Time: Start _____stop _____

Observers_____

Notes: _____

When graphic recording is not employed, the same information should be entered on a form such as that shown in tables 4–3 or 4–4 and 4–5. Some of the data may appear to be superfluous at the time of observation, but it is often invaluable when trying to interpret results at a later date. A separate record sheet or graphic record chart should be used for each measurment location.

A sample description of a measurement site is as follows:

Site No. 21—10.14 miles north of Riverside, California, State Route 13 (0.19 miles south of intersection with State Route 5), 210 feet east of highway in open field; grove of trees approximately 150 feet high lies 900 feet northeast of site; nearest wire lines 300 feet east, running north and south; nearest wire fence 120 feet south, running east and west, terrain slightly rolling; check showed uniform field conditions.

In the "Remarks" column of the data sheet, enter all pertinent information such as height of antenna, weather and atmospheric conditions, poor minima, local interference, fluctuations in signal strength, antenna current known, operational difficulties, and any other data that may be useful.

The observed field intensity may be measured and listed in either microvolts-per-meter or in decibels above one microvolt-per-meter. It is sometimes desirable, however, to be able to convert from one to the other. The following formula may be used for this purpose:

FI decibels above 1 microvolt-per-meter $=$ 20 x $\log_{10}$ FI microvolts-per-meter.

b. RADIO INTERFERENCE CONSIDERATIONS.

(1) SELECTING THE SITE FOR GENERAL INTERFERENCE SURVEYS.—An open flat terrain is preferred to preclude absorption by dense growths of trees and steep ridges. Also, the face of a nearby cliff may act as a reflector and produce local variations in the intensity of interference measured.

In order to isolate the radiated field from the induction field of a source of interference, radio interference measurements of a radiating source should be made at distances greater than twice the wavelengths of the radiated energy.

In general, interference surveys made in the vicinity of power lines are subject to inaccurate results because of possible reradiation from the power lines and because it is necessary to measure at considerable distance from the power lines. Every attempt should be made to avoid locating the equipment near closed loops present in iron-framed buildings and topside structures aboard ship. If possible, avoid locations in the vicinity of underground pipes, trolley cables, or rail lines.

When the equipment is installed in a vehicle, it should be remembered that the metal body and frame of the vehicle tend to distort the pickup pattern of the dipole antenna. In addition, closed loops formed by vehicle wiring or structural members will affect the field pattern. In some cases, these errors can be determined with the equipment mounted in a designated location. Correction factors so obtained may then be applied to compensate for pickup pattern distortion.

When a variety of equipment, including radio receivers, is employed at any one site, check for interaction.

Choose at least three sites not in a line for radio interference surveys, since triangulation is used to locate the source of interference.

Note

Survey results must be evaluated according to how close actual survey sites approach ideal conditions.

(2) INTERFERENCE SURVEY.—An interference survey of a suspected area should begin with a series of measurements, at the frequencies under investigation, made with the appropriate pickup. It is customary in general surveys to make measurements at five frequen-

cies in each band of the equipment, with sufficient overlap to insure complete coverage of all bands. Should a station or service be found operating on the frequency selected for measurement, move sufficiently away in frequency to avoid side bands of the station. The survey report should, however, note the frequency and field intensity of signals from the station.

Certain types of interference surveys requíre scanning an entire band for evidence of peaks or minima. Any such peaks or minima found must be measured and noted in the survey report.

During the survey, the received signals should be aurally monitored at a volume level that will enable identification of the received signal or interference.

TABLE 4-3. FIELD INTENSITY DATA RECORD SHEET

Date ..... Transmitting station .....

Radio Interference Measuring Set AN/URM-47A Ser. No. .....

Meas. Site .....
[On back of this sheet, list all pertinent site data as suggested in paragraph 7.*a.* (3)]

Observers .....

Distance from trans. ..... naut. mi. .....

stat. mi. .....

1	2	3	4	5	6	7		8
TIME	FREQ	IND μv	ATT SET	CORR FACT	PICKUP	FIELD INTENSITY μv/m	db	REMARKS

Notes: (1) Col. 3 is indicated microvolts on the RI-FI Meter.
Col. 4 is attenuator setting of RI-FI Meter.
Col. 5 is the correction factor of the RI-FI Meter.
Col. 6 is the type of pickup, loop or dipole antenna.
Col. 7 is the resultant field intensity.
μv/m = Col. 3 x Col. 4 x Col. 5
(db) = 20 x $\log_{10}$ (μv/m)
Col. 8 is for notes on weather conditions, operational difficulties, transmitting antenna current, height of transmitting and receiving antenna, etc.
(2) Be certain to fill in sheet numbers in right hand corner to maintain continuity of data sheets.

Tested by: _____

TABLE 4-4. RADIO INTERFERENCE DATA SHEET

Test Location _____ Test Number _____

Specification _____ Date _____

Test Sample:

TYPE		OTHER:
MFR.		
MODEL		
SERIAL		
FREQ RANGE		
CURRENT		
VOLTAGE		
LINE FREQ.		
POWER		

Radio Interference Correction Measures Incorporated in Test Sample.

Test Equipment:

MODEL				
FREQ.				
SERIAL				
CAL.				
PICKUP				
PICKUP				
PICKUP				

Tested by: _____

_____

Note: Make detailed site description, diagrams, and remarks on reverse side

Sheet One of____ Sheets

TABLE 4-5. RADIO INTERFERENCE DATA SHEET

Test Equipment: Model _____ Test Number _____
Serial _____
Pickup _____ Date _____

Test Sample: Type _____ Model _____

BAND	FREQ. IN MC	CORR. FACT.	FI		QP		PEAK		PEAK	REMARKS
			IND.	CORR.	IND.	CORR.	IND.	CORR.		

Tested by: _____
_____

Note: Attenuator settings for indicated readings shown by powers of ten
Additional remarks and notes on reverse side.

Sheet _____ of _____ Sheets

Three-point fixes on each source of interference enable the geographic location to be determined by triangulation, using magnetic bearing. The next step is to investigate each interference source in turn, moving the RI-FI Meter close to each source of interference and refining the distant fix previously obtained. When the location has been narrowed down to a small area, use the loop probe to determine the offending equipment or power line.

If the interference source is found to be a power line or other current-carrying conductors, substitute the line probe for the loop and use the RI-FI Meter as a two-terminal voltmeter to determine the amount of conducted interference on the line.

WARNING

STANDARD SAFETY PRECAUTIONS SHOULD BE TAKEN WHEN CONNECTING TO POWER LINES OF ANY EQUIPMENT WHICH MAY BE ENERGIZED FROM A SWITCH NOT UNDER THE CONTROL OF THE OPERATOR OF RADIO INTERFERENCE MEASURING SET AN/URM-47A. ALL CONNECTIONS SHALL BE MADE WITH THE POWER DISCONNECTED FROM THE LINES OR EQUIPMENT.

(3) RATIONALIZING OF INTERFERENCE DATA.—It may be observed that a difference in meter indication may exist between two RI-FI Meters in the same location measuring the same noise signal. It is the purpose of the following paragraphs to explain and provide correction factors for this effect.

Variations in the "Q" of tuned circuits, in tube loading, in individual electron tube characteristics and slight tracking differences are normally present in all equipments of this type. For this reason variations in the overall bandpass of equipments are present.

This problem may be resolved by converting the meter reading into microvolts-per-kilocycle bandwidth as a two-terminal voltmeter and into microvolts-per-meter-per-kilocycle bandwidth as a field intensity meter.

If the bandwidth is other than one kilocycle, then the conversion factor (K), by which the meter reading is to be multiplied, will depend upon the type of signal and the bandwidth, as shown below.

(*a*) In the case of a sine wave signal, the peak, average and effective voltages are *independent* of bandwidth. The factor, applicable to readings taken in function switch positions FIELD INTENSITY, QUASI PEAK, and PEAK, is therefore:

$$K = 1$$

(*b*) For an interference signal of a predominantly random nature, the peak and average voltages are proportional to the square root of the effective "random interference" bandwidth. The signal is assumed to be random in nature if the ratio of the QP/FI readings is approximately 2 or less. The conversion factor, also applicable to readings taken in function switch positions FIELD INTENSITY, QUASI PEAK, and PEAK, is:

$$K = \sqrt{\frac{1\text{ kc}}{\text{Effective "random interference" bandwidth in kc}}}$$

(Example: Determine the signal strength in microvolts-per-meter-per-kilocycle when the RI-FI equipment, used as a field intensity meter, indicates 1200 microvolts-per-meter. The QP function was used to measure this value. The frequency is 116 megacycles, the interference signal is predominantly random, and the effective "random interference" bandwidth is 116 kilocycles (see figure 4—6 for bandwidth):

$$K = \sqrt{\frac{1\text{ kc}}{116\text{ kc}}} = 0.0928$$

1200 x 0.0928 = 111.36 microvolts-per-meter-per-kilocycle.)

(*c*) When the interference signals are predominantly impulsive, the peak value of the voltage is directly proportional to the effective impulsive bandwidth. The signal is assumed to be impulsive in nature if the ratio of the QP/FI readings is greater than 2.

A conversion factor for impulsive measurements is not necessary with this equipment. The procedure for measuring impulsive signals as presented under paragraph 4-4.*e*(6) provides readings directly in terms of microvolts-per-kilocycle without involving bandwidth.

Average and quasi-peak readings of impulsive signals are also influenced by pulse repetition rate, pulse width, charge time of weighting circuits and the overload factor. For this reason, a definite conversion factor cannot be supplied.

(*d*) The following chart will enable the operator to determine proper detector functions and multiplication factors to use in making various types of measurements.

INTERFERENCE PLUS SIGNAL CHART

TYPE NOISE (1)	TYPE SIGNAL (2)	DETECTOR FUNCTION	DIRECT	RMS*
Random	Sine Wave	Field-Intensity Quasi-peak	X	X
Random	Random	Field-Intensity Quasi-peak		X X
Random	Impulse High Repetition	Field-Intensity Quasi-peak	X	X

Note: International interference is of a random nature.

**RMS = Root Mean Square, e.g.,*

$$\sqrt{|signal\ (1)|^2 + |signal\ (2)|^2}$$

SECTION 5

OPERATOR'S MAINTENANCE

5-1. INTRODUCTION.

Operator's maintenance procedures are limited to emergency tube change and replacement of line fuses in the RI-FI Meter and power supply units.

5-2. EMERGENCY MAINTENANCE.

a. TUBE REPLACEMENT. *(See figures 5—1 through 5—4.)*—

Note

Because of the precision nature of this equipment and because of the danger that unnecessary removal and handling subject them to possible breakage, the routine checking and replacement of tubes is *discouraged.* Several ruggedized tubes have been employed, particularly to make use of their long life expectancy. The equipment actually constitutes a tube tester in itself, for it provides self-contained calibration and standardizing means. Periodic testing of tubes in this equipment should be avoided. In case of equipment failure because of a faculty tube or tubes, be sure to replace each tube in its original socket after checking; this is imperative in order to prevent the need for realignment of the equipment.

In an emergency the RI-FI Meter and power supply units can be opened in the field for testing and replacing defective tubes. The locations and identification of all tubes are shown in figures 5—1 and 5—2. If available, use a miniature tube pin straightener to align the pins of the miniature tube bases (see figure 5—3).

Note

If the video amplifier tube V113 must be replaced, be sure to use the same type tube (6AU6WA). If this type is not available, a type 6AU6 can be used for replacement. If the fifth i-f amplifier tube V110 must be replaced, use the same type tube (6005); if not available, however, a type 6AQ5W may be used. Use these alternate tube types only when absolutely necessary. Do not use alternate tube types for any of the other tubes in the RI-FI Meter.

To open the RI-FI Meter for tube replacement, place the unit face down on the two front panel guards. Loosen two Dzus fasteners on the back of the instrument case. Lift the case off the chassis. The miniature tubes in this equipment are held in place by spring-loaded tube shields. To remove a tube, depress and turn the tube shield counterclockwise, then lift. To remove tubes, use rubber tube extractor located on right-hand gusset above the r-f head (see figure 5—5).

CAUTION

Do not remove any tube without first turning off the set. Failure to observe this caution can result in excessive voltage at the filaments (heaters) of some other tubes in the set. The ballast resistor in the power supply may fail if subjected to an overload.

Subminiature tubes are located within the r-f stages and can be removed, if necessary, for replacement. Disengage the cable strap holding the cable associated with P104. Detach the AUDIO and function switch shaft couplings (see figure 7—3) by means of the Allen wrenches, H135, H136, and H137, which are mounted on top of the r-f head shield cover (see figure 5—5). (Note the position of the function switch for replacement purposes.) Loosen two Dzus fasteners, one on each side of the chassis, and remove two screws located at the rear of the r-f attenuator. Remove the i-f chassis and the r-f head shield cover for access to the subminiature tubes. The subminiature tubes are held in place by cylindrical silver-plated bronze shields (see figure 5—4) which are attached to tube shield plates. The tube shield plate is used to conduct and dissipate the heat emitted from the tube.

Each tube shield plate is held to the adjacent compartment shield by means of a captive knurled nut. Loosen the knurled nut. Slide out the shield assembly in a direction away from the tube socket. The tube can now be removed from the shield by gently pushing the tube out, using a pencil eraser against the end opposite the pins. If the tube shield plate does not remove the tubes, the tube extractor may be used. (The tube extractor is normally stored on the right-hand gusset above the r-f head, see figure 5—5.) The new tube is mounted in the socket and then the shield plate with spring shields placed over the tube.

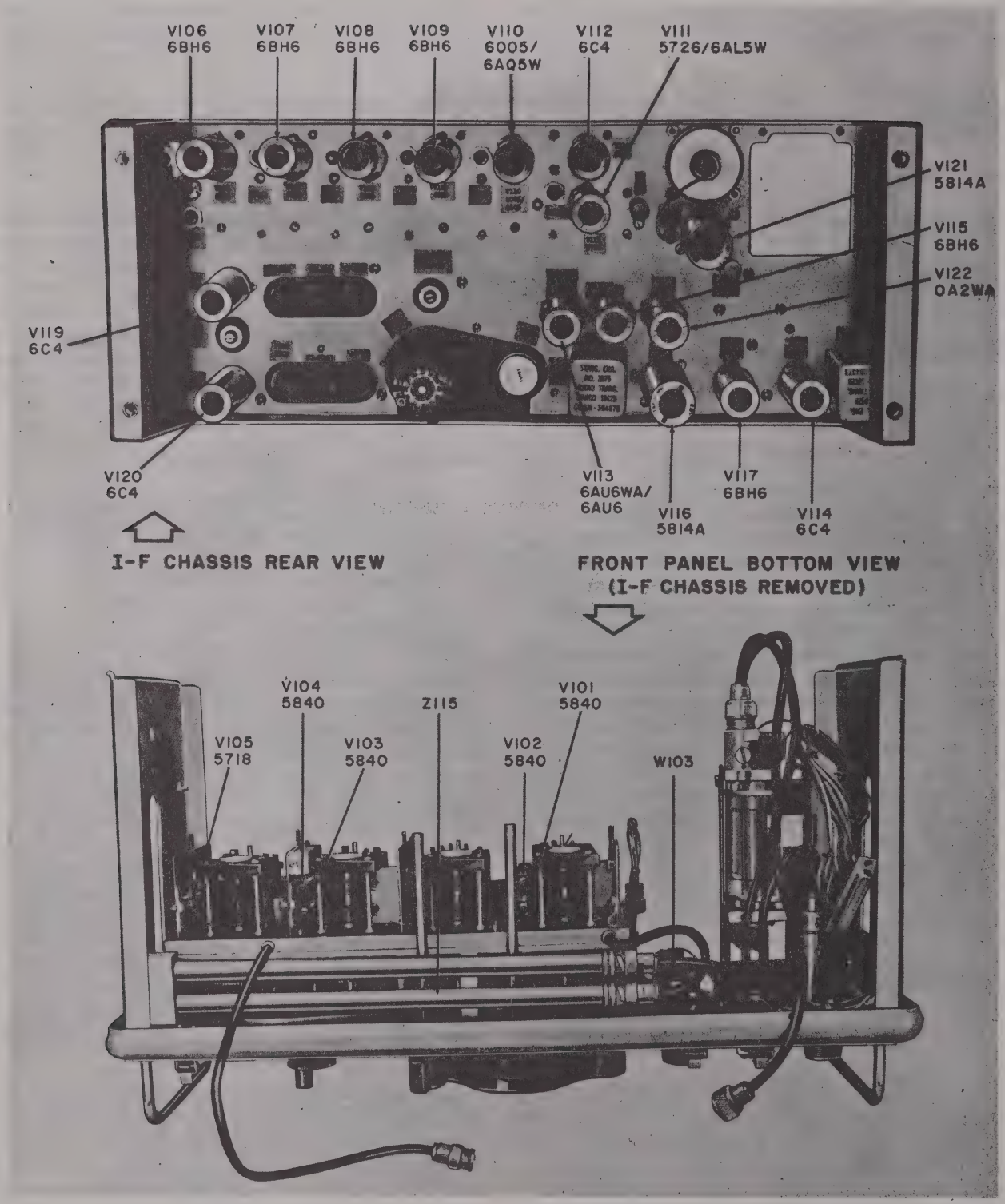


Figure 5-1. Radio Interference-Field Intensity Meter IM-88/URM-47, Tube Locations

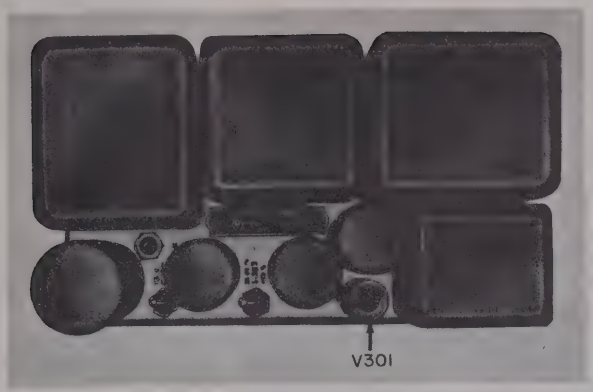


Figure 5-2. Power Supply PP-906A/URM-47, Tube Locations

Note

Be sure that the replaced tube shield plate makes contact with two spring clips located adjacent to the socket.

Should any of the following tubes be replaced, the associated control circuits may be affected:

(1) The B+ voltage may be adjusted to 225 volts by means of the regulator adjustment control R313 (see figure 7–9).

(2) Tube V106 influences the X10 position of the attenuator and also the tuning of T151 and T152. In the event of replacement, repeat the alignment procedure in paragraph 7-8.*c*.(2).

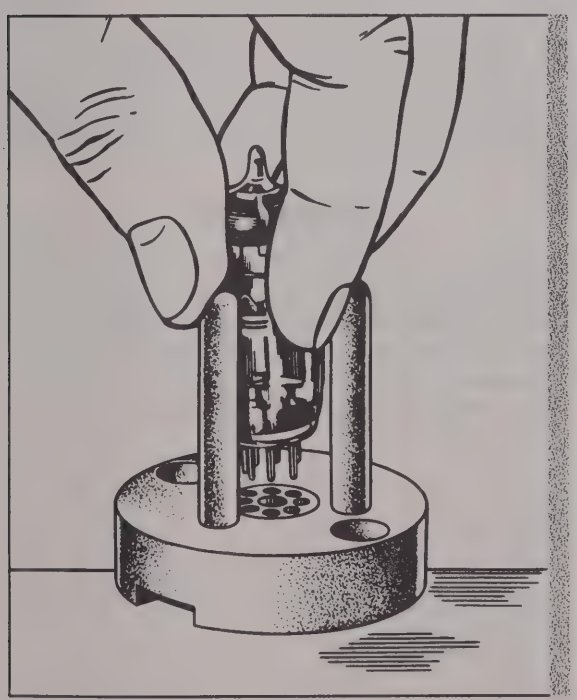


Figure 5-3. Miniature Tube Pin Straightener

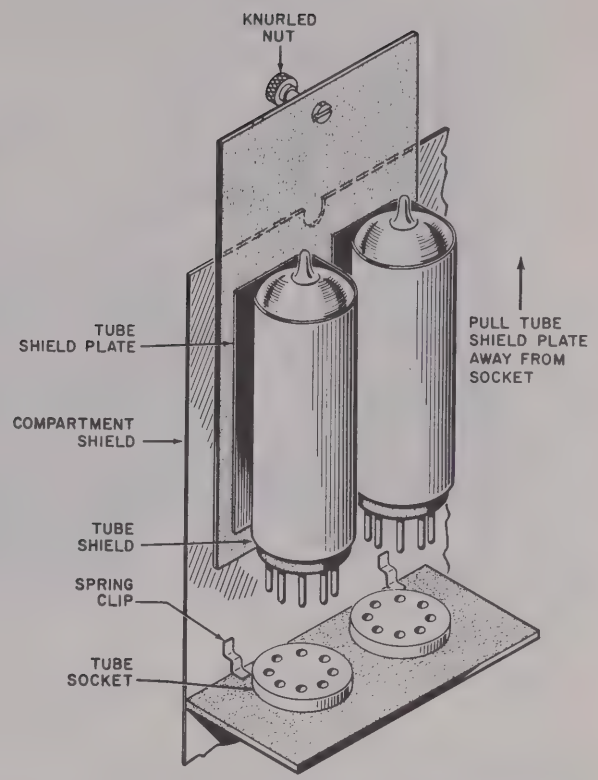


Figure 5-4. Removal of Subminiature Tubes

(3) Tubes V107 and V108 influence the output meter scale tracking and also the tuning of T152, T153, and T154. In event of replacement, repeat the alignment procedure of paragraph 7-8.*c*.(2).

(4) Tube V109 controls the gain equalization between the FIELD INTENSITY and QUASI PEAK position of the function switch and also tuning of T154 and T155. If replacement of this tube is necessary, review the alignment procedure of paragraph 7-8.*c*.(2).

(5) Replacement of V110 may affect the dynamic range of the equipment and the tuning of T155 and T156. Repeat the alignment procedure in paragraph 7-8.*c*.(2).

Note

In removing the tube shield of V110, observe the aluminum washer placed between the top of the tube and the tube shield. This washer is required to maintain a fixed capacity between the tube shield and the tube elements. Place the washer on top of V110 before replacing the tube shield. In the event the washer has been lost, obtain a replacement with the following dimensions: 51/64 in. OD by 0.144 in. ID by 1/32 in. thick.

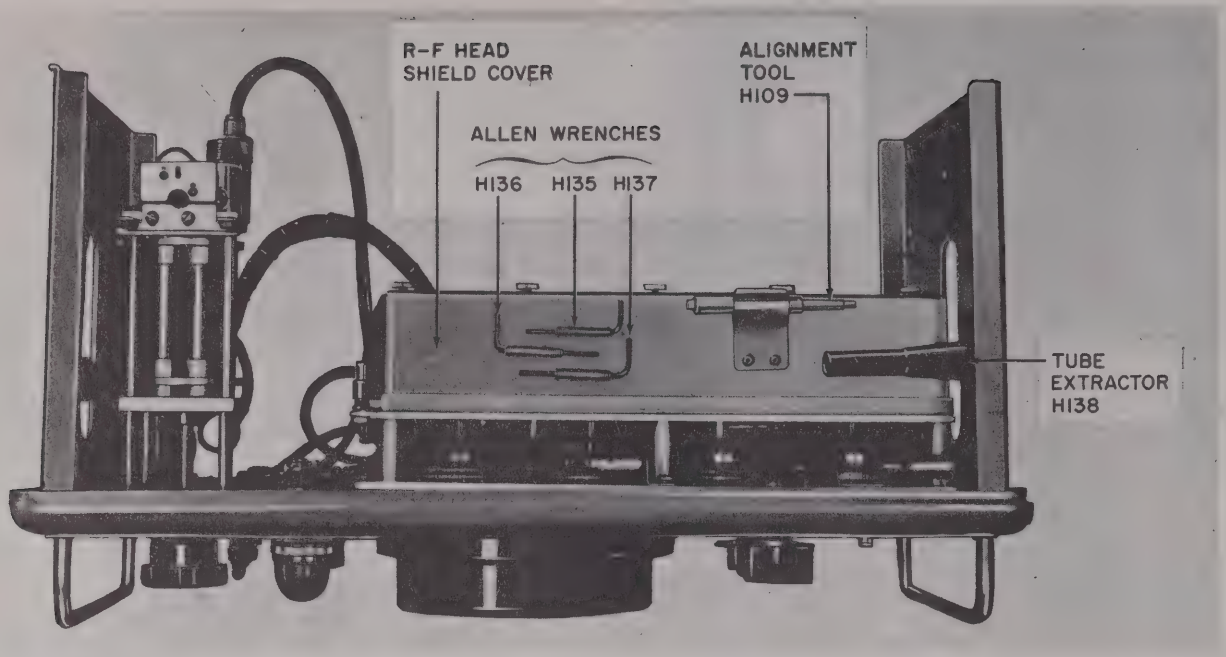


Figure 5-5. Radio Interference-Field Intensity Meter IM-88/URM-47, Location of Accessory Tools

(6) The output meter scale tracking in the lower portion of the scale and the tuning of T156 may be affected by a replacement of tube V111. This can occur in all positions of the function switch, except the BFO position. In event of replacement, repeat alignment procedure of paragraph 7-8.*c*(2).

(7) Tubes V119 and V120 influence the meter zero adjustment. Tube V119 also can influence the AGC circuit in the event of gas current (new tubes are especially poor in this respect). In event of replacement of V119 or V120 review alignment in paragraph 7-8.*b*.

To open Power Supply PP-906A/URM-47, place the unit down on the two front panel guards and remove the ten screws from around the sides of the instrument case. Lift the case off the chassis.

Tube V301 in the power supply can be replaced without seriously affecting the calibration of the RI-FI Meter, providing the B+ voltage is maintained at +225 volts by means of regulator adjustment control R313.

Note

Be certain to replace all tube shields and to lock all tube clamps before closing the units.

b. FUSE REPLACEMENT.—Either or both of the line fuses may be blown if the indicator lamp on the power supply unit does not light when the POWER switch is placed in the ON position. Spare fuses of the same rating are located in the spare fuse holders on the power supply front panel. Replace fuses in the spare fuse holders (after the spares have replaced the line fuses) as soon as possible.

WARNING

Never replace a fuse with one of a higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it again until the cause has been located and corrected.

SECTION 6

PREVENTIVE MAINTENANCE

6-1. GENERAL.

Preventive maintenance procedures for the RI-FI Meter and the power supply units should be kept to a minimum for the following reasons:

(1) There is little likelihood of moisture or dirt accumulating inside the units to result in breakdowns because the main units are drip-proof.

(2) Components, including electron tubes, used in the equipment under normal conditions of operation have long life.

(3) No parts in the basic equipment require lubrication. Careful handling while setting up and during operation will prevent most breakdowns from occurring.

a. VOLTAGE CHECK.—Connect Power Supply PP-906A/URM-47 to a 115-volt, 60-cycle external power source. Measure the voltages appearing at the RI-FI Meter receptacle J106 under load conditions. Correct voltages at J106 are: 6.3 volts ac between pin A and chassis, +225 volts dc between pin B and chassis, and −105 volts dc between pin C and chassis. (See figure 7−14.)

b. SENSITIVITY AND CALIBRATION CHECKS.—These checks are embodied in the operating procedure. The operator must standardize the gain of the equipment according to the instructions given in paragraph 4-4.*e.* The operator can detect any radical change in the sensitivity of the unit because this condition will necessitate a CALIBRATE control setting at a point greatly different from that normally used to obtain standard gain. Low sensitivity is usually accompanied by abnormally high internal noise level indicated on output meter.

c. IMPULSE CALIBRATOR GENERATOR CHECK.—Check the operation of the impulse calibrator at periodic intervals of approximately 100 operating hours for variations in amplitude of the output pulses. Refer to paragraphs 7-4.*b.*(3).(*a*) and 7-4.*b.*(3).(*b*) for complete checking procedures.

SECTION 7

CORRECTIVE MAINTENANCE

7-1. INTRODUCTION.

The procedures, illustrations, and tables in this section are for the purpose of assisting maintenance personnel in the repair and adjustment of Radio Interference Measuring Set AN/URM-47A. When the equipment has failed in operation, the source of the trouble must be located, the defect remedied, and the equipment restored to operating condition. The information is, therefore, presented in the following order:

Localization of Trouble (paragraph 7-2)

Removal of Chassis from Instrument Cases (paragraph 7-3)

Radio Interference-Field Intensity Meter IM-88/URM-47 Trouble Shooting and Repair (paragraph 7-4)

Power Supply PP-906A/URM-47 Trouble Shooting and Repair (paragraph 7-5)

Maintenance Procedures (paragraphs 7-6 through 7-9)

Illustrations contained in this section include an overall schematic diagram, practical wiring diagrams, voltage and resistance data, and internal views of the equipment with component parts identified by reference symbol number.

Table 7—1 lists all the accessory test equipment necessary for proper maintenance of the equipment.

The tables included at the end of this section are:

Table 7—3. Electron Tube Operating Voltages

Table 7—4. Winding Data

Note

Maintenance personnel must fill out a failure report for each part, component, tube, or mechanical assembly repaired or replaced.

7-2. LOCALIZATION OF TROUBLE.

a. INTRODUCTION. — Trouble-shooting problems in Radio Interference Measuring Set AN/URM-47A may be located just as troubles are located in communication receivers. Inspect the entire equipment in an attempt to isolate the faulty unit. Check the interconnecting cabling between units. Determine that the required power is applied to Power Supply PP-906A/URM-47 and that the operating potential outputs of the power supply are applied to the RI-FI Meter. The power supply indicator lamp I301 and the RI-FI Meter dial light I101 serve to indicate power application to the respective units. Determine whether or not an output indication can be obtained on the remote meter. Check that panel operating controls are properly employed as described in Section 4.

If one of the r-f input devices is the source of the trouble, check the continuity of the circuit through the suspected device.

When apparent lack of operating potential output from the power supply is noted, check by making voltage measurements at the output connector.

Note

The power supply may become warm during normal operation but this is not to be considered as an indication of a defect.

In the event malfunctioning of the equipment is caused by the RI-FI Meter, continue the elimination procedure with the aim of locating the faulty stage. The RI-FI Meter is similar to a communications receiver, having an r-f section, i-f section, and a-f section. In addition, it has a calibrator circuit, VTVM circuit, attenuation circuits, detector weighting circuits, and a pulse amplifier and visual null indicator circuit. Consult the trouble shooting chart, figure 7—2, for aid in locating a faulty stage or circuit.

One major source of improper equipment operation is incorrect calibration and alignment control adjustment. Operational tests are given in this section to aid in determining the efficiency of equipment operation. Complete calibration and alignment procedures are also given to aid in bringing the equipment up to its highest sensitivity and accurate calibration. (See paragraphs 7-6 through 7-9.)

b. OPERATIONAL TESTS. *(See figure 7—2.)*— When localizing procedures definitely point to a trouble in the RI-FI Meter, the source can readily be traced to any given stage. The calibrating circuit of V121 constitutes a convenient signal generator for checking the receiver operation. Turn the function switch S102 and the PULL-TURN-PUSH attenuator control to the CAL position. This results in the appli-

TABLE 7-1. ACCESSORY TEST EQUIPMENT

Signal Generator AN/URM-26 series, TS-497/URR, or equivalent high-impedance input instrument.
6-db, 50-ohm pad for output termination of signal generator.
Electronic Multimeter AN/USM-34, ME-25/U, Multimeter AN/PSM-4, or equivalent 20,000-ohm-per-volt multimeter.
Frequency Meter AN/USM-29 series, Frequency Meter LM series, or equivalent.

cation of plate voltage to the calibrator circuit and consequent injection of an impulse noise signal at the receiver input. If the r-f, i-f, and detector circuits are functioning, an audible pulse signal will be heard in the headphones with PEAK control (C) counterclockwise and CALIBRATE control (D) clockwise. To check the visual null indicator circuit, proceed as follows: Rotate PEAK control (C) to its maximum clockwise position. Rotate PEAK SENS. control (E) clockwise until PEAK indicator lamp I102 lights. Rotate PEAK SENS. control (E) counterclockwise until indicator lamp just ceases to light. Check the audio and video sections by setting function switch (B) to the FIELD INTENSITY position, tune receiver to a known frequency, then adjust AUDIO control (F) for comfortable audio volume level in headphones.

7-3. REMOVAL OF CHASSIS FROM INSTRUMENT CASE.

Upon determining that the trouble source is in either the RI-FI Meter or power supply, the next step is to remove the suspected chassis from its case and trace the trouble to a faulty component.

To open the RI-FI Meter, stand the unit on its front panel guards. Loosen two Dzus fasteners on the back of the instrument case. Slide the case off the chassis.

To open the power supply, stand the unit on its front panel guards. Remove ten screws at the sides and slide the case off the chassis.

The i-f chassis section of the RI-FI Meter may be removed from the main chassis section. Disengage the cable strap holding the cable associated with P104. Detach the AUDIO and function switch shaft couplings (see figure 7—3) by means of the Allen wrenches H135, H136, and H137 which are mounted on top of the r-f head shield cover (see figure 5—5). (Note the position of the function switch for reassembly purposes.) Loosen two Dzus fasteners, one on each end of the chassis, and remove two screws located at the rear of the r-f attenuator. The i-f chassis can now be removed for inspection, trouble shooting, etc.

The units can be reassembled by following the given procedures in a reverse sequence.

FAILURE REPORT

"Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE REPORT form DD 787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Bureau of Ships. However, the importance of providing complete information cannot be emphasized too much. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember—there are two sides to the failure report—

"YOUR SIDE"

"Every FAILURE REPORT is a boost for you:
1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

"BUREAU SIDE"

"The Bureau of Ships uses the information to:
1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

"Always keep a supply of failure report forms on board. You can get them from the nearest District Publications and Printing Office."

Figure 7-1. Failure Report, Instructions

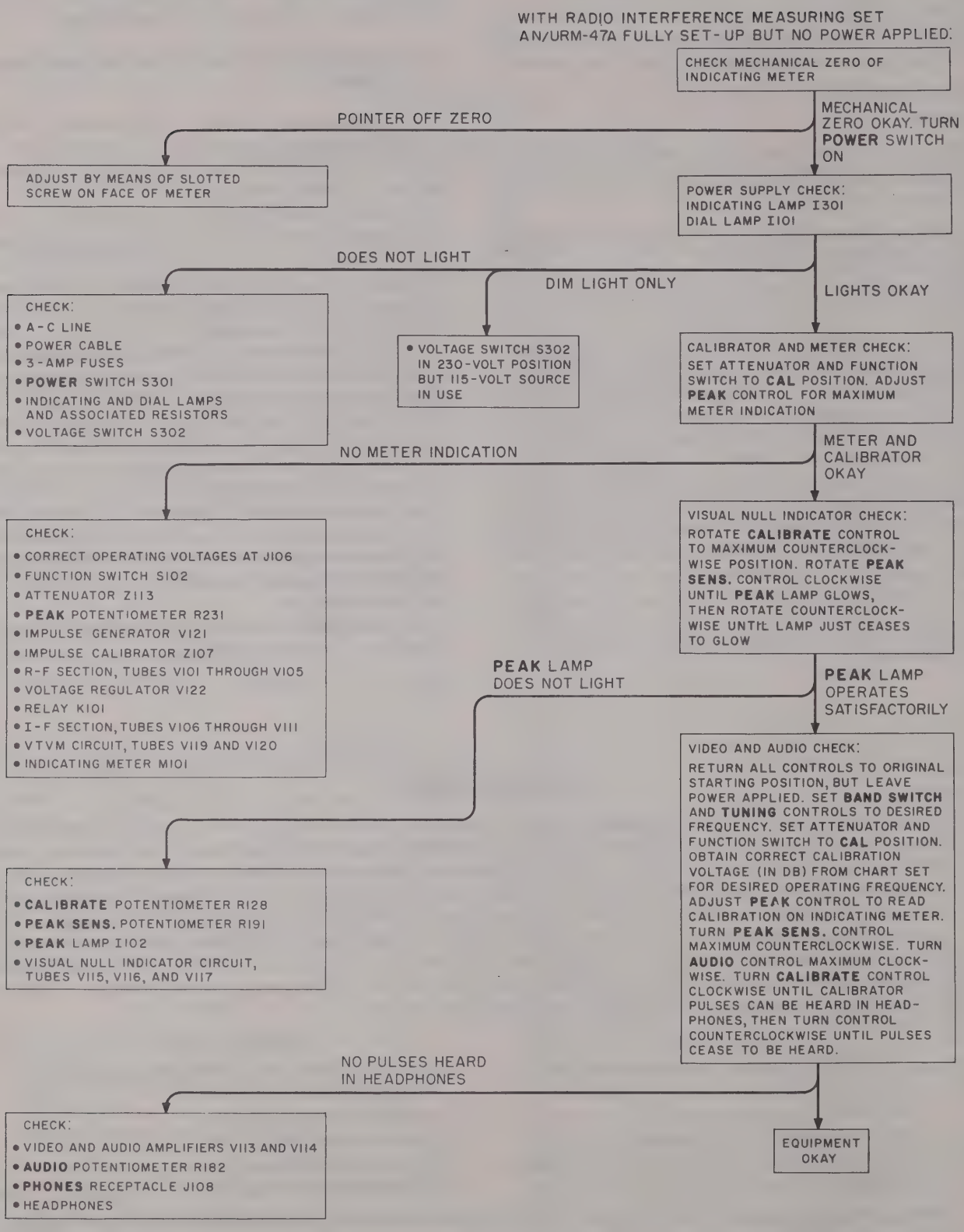


Figure 7-2. Radio Interference-Field Intensity Meter IM-88/URM-47, Trouble Shooting Chart

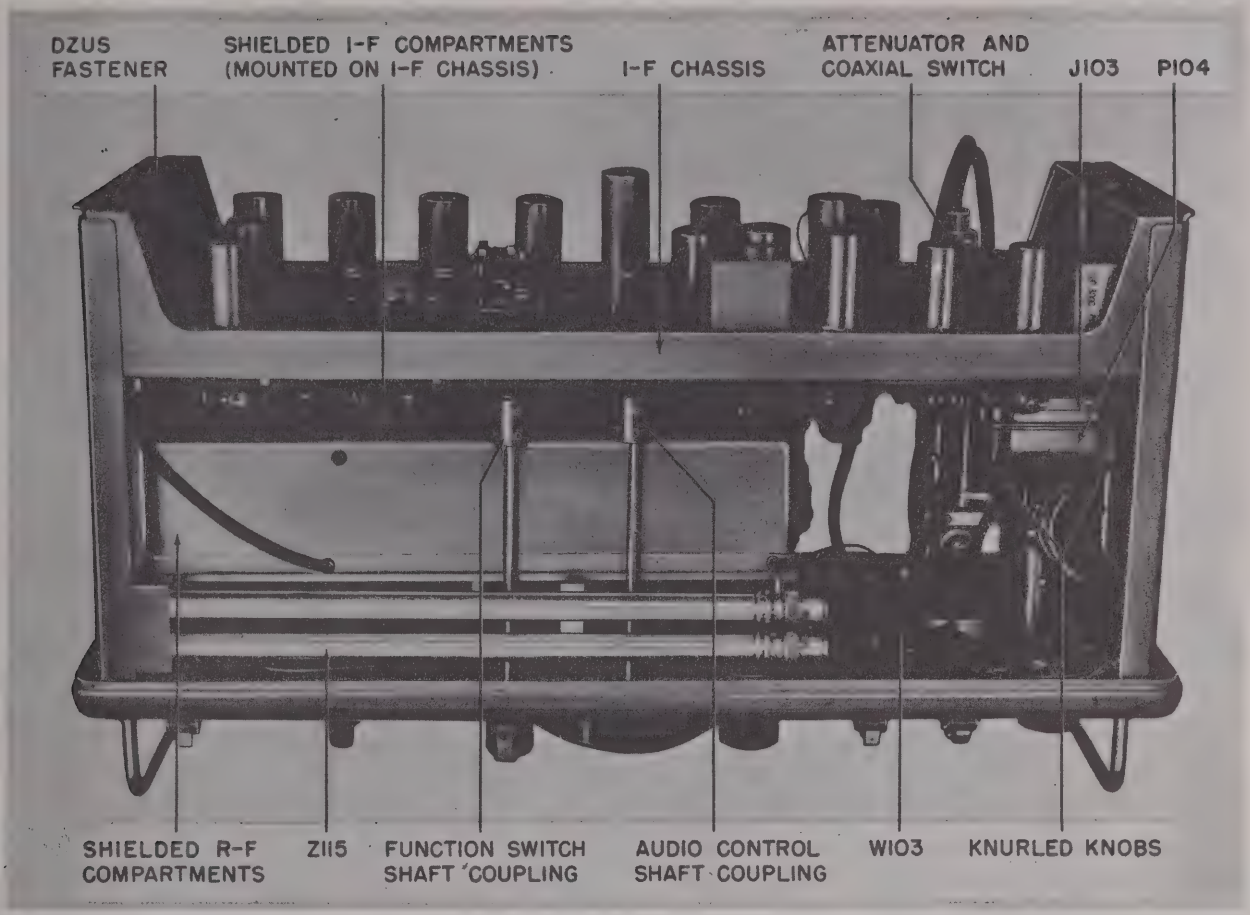


Figure 7-3. Radio Interference-Field Intensity Meter IM-88/URM-47, Chassis Bottom View (Case Removed)

7-4. RADIO INTERFERENCE-FIELD INTENSITY METER IM-88/URM-47 TROUBLE SHOOTING AND REPAIR.

a. TROUBLE SHOOTING DATA.—
Schematic Diagram—Figure 7—14
Practical Wiring Diagram—Figure 7—12
Voltage and Resistance Data—Figure 7—11
Component Locations—Figures 7—3 through 7—8
Winding Data—Table 7—4

b. REPAIR AND ADJUSTMENT DATA.

(1) ACCESS TO COMPONENTS. *(See figures 7—3 through 7—8.)*—In accordance with shielding requirements at the high frequencies employed in this equipment, the r-f and i-f stages are enclosed within separate individual shielded compartments. The covers of the r-f and i-f stage compartments can be readily removed by unscrewing the fastening screws and nuts. Allen wrenches are supplied with the equipment (see figure 5—5) for aid in removal of components.

(2) TUBE CHANGE.—The tubes employed for this equipment have been especially selected for specific characteristics. In order to avoid any possible upset of alignment and calibration, avoid interchanging tubes and replace tubes only when absolutely necessary. Tube locations are shown in figure 5—1. Subminiature tubes are employed within the r-f compartments. Refer to paragraph 5-2 for the removal of subminiature tubes.

(3) CHECKING AND MAINTAINING IMPULSE CALIBRATOR.—The impulse calibrator (Z107) should be checked for uniformity of output pulse amplitude at periodic intervals of approximately 100 operating hours. Variations in amplitude of the output pulses indicate defective or dirty contact points. The method for detecting such variations and the maintenance procedures required to insure normal operation of the impulse calibrator are given below.

(a) CHECKING CONTACT CONDITION.

Step 1. Set up the equipment for normal operation, apply power and allow a suitable warm-up period before proceeding.

Step 2. Calibrate the equipment for standard gain choosing an operating frequency near the low-frequency limit of the equipment.

Step 3. Using the PEAK control as an adjustment, determine the threshold point where the pulses

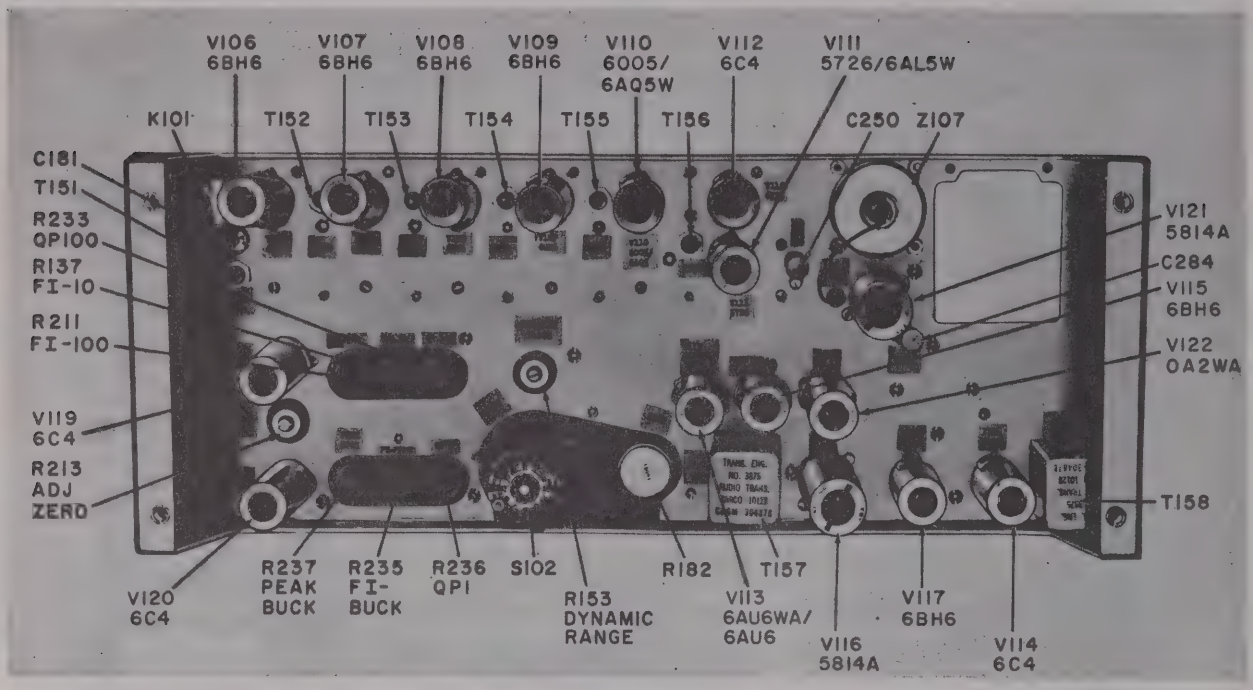


Figure 7-4. Radio Interference-Field Intensity Meter IM-88/URM-47, Chassis Rear View (I-f Chassis)

just become inaudible (or lamp of visual null circuit just ceases flashing) in the headphones. Note the meter scale indication in decibels.

Step 4. Slowly rotate the PEAK control counterclockwise until all of the pulses are audible in the headphones (or lamp just flashes in unison with mechanical sound of contactor), but do not exceed this point. Note the meter scale reading in decibels for this condition.

Step 5. Subtract the reading obtained in Step 4 above from the reading noted in Step 3 above. The difference should be less than about two decibels if the impulse calibrator is functioning properly. If the difference is more than about two decibels, dirty contacts are indicated and maintenance is required as outlined in subparagraph (*c*) below.

(*b*) CHECKING CONTACT GAP SPACING.

Step 1. Leave the calibration setting of the equipment fixed at the point determined in subparagraph (*a*) above. Reverse the polarity of the charging potential applied to the impulse calibrator by roating the function switch to FI position and then returning it to the CAL position.

Step 2. Repeat the adjustment given by Step 3 in subparagraph (*a*) above and note the meter scale reading in decibels for the reversed charging polarity.

Step 3. Compare the meter reading obtained in Step 3 of subparagraph *(a)* above with that obtained in Step 2 above. If the difference in readings is less than about 0.8 db, the spacing between contacts is satisfactory. If the two readings differ by more than 0.8 db, the gap between contacts may be excessive. The following step should be performed before attempting to adjust contact spacing.

Step 4. Measure the charging potential applied to the feed-through capacitor on one end of the impulse generator for both positive and negative polarity. An electrostatic voltmeter, or d-c vacuum tube voltmeter having an input impedance of at least 100 megohms should be used for this test to prevent excessive current drain through the series supply resistances. The charging potentials measured should normally be equal within plus or minus six per cent. If the values are considerably different, the voltage supply sources should be investigated. If the charging potentials are within the correct limits, and the difference in meter readings for standard gain settings with opposite charging potentials is still more than about 0.8 db, the contact gap spacing should be adjusted as outlined in subparagraph (*d*) below.

(*c*) CLEANING CONTACTS.—If the test outlined in subparagraph (*a*) above has been made and dirty contacts are indicated, the following steps should be taken:

Step 1. Remove the main chassis from the instrument case and detach the i-f section chassis as outlined in paragraph 7-3. Lay the i-f section alongside the main chassis with the front panel side of the i-f chassis facing up. Disconnect P106 from the impulse calibrator (Z107) output receptacle (see figure 7—4).

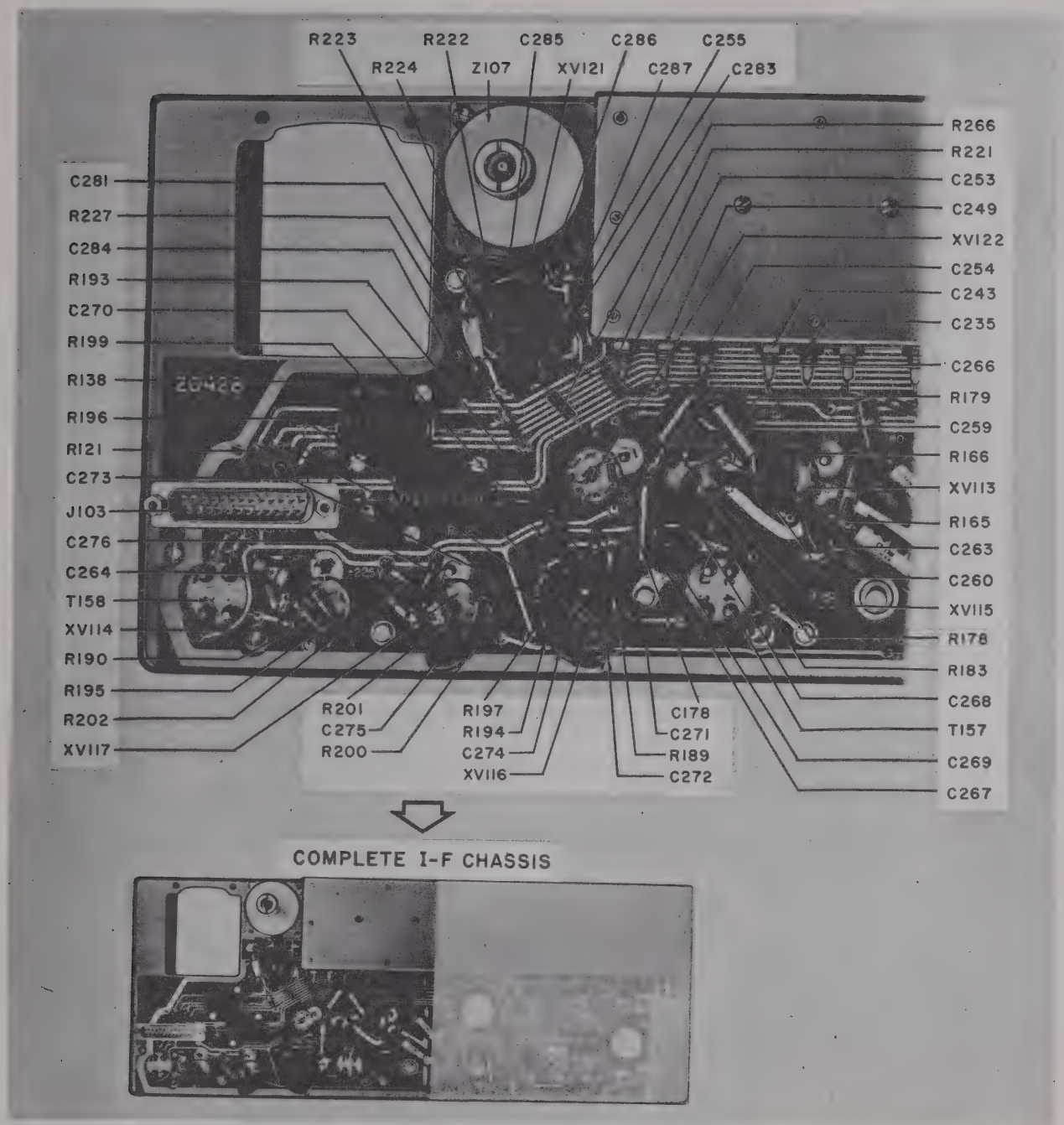


Figure 7-5. Radio Interference-Field Intensity Meter IM-88/URM-47, I-f Chassis Front View (Sheet 1 of 2 Sheets)

Step 2. Using the No. 6 Allen wrench (H135) supplied with the equipment, loosen the two set screws holding the pulse output receptacle.

Step 3. Loosen the receptacle body, using a piece of 1/16-inch sheet metal or a twenty-five cent coin piece as a screwdriver placed in the slots in the end of the receptacle. Place the i-f chassis facing up so that the movable contactor will not drop out when the connector body is removed. Unscrew the connector by hand. The connector body, connector pin, a series resistor, a shunt disc resistor, the discharge contact and housing should emerge as a unit. If only the connector body comes away, remove the remaining pieces as a unit.

Step 4. Place a piece of clean white bond paper on a flat surface; hold the connector body vertical and burnish the contact on the inner end of the connector by using a circular motion to slide the contact lightly over the paper. Burnish until all blackened

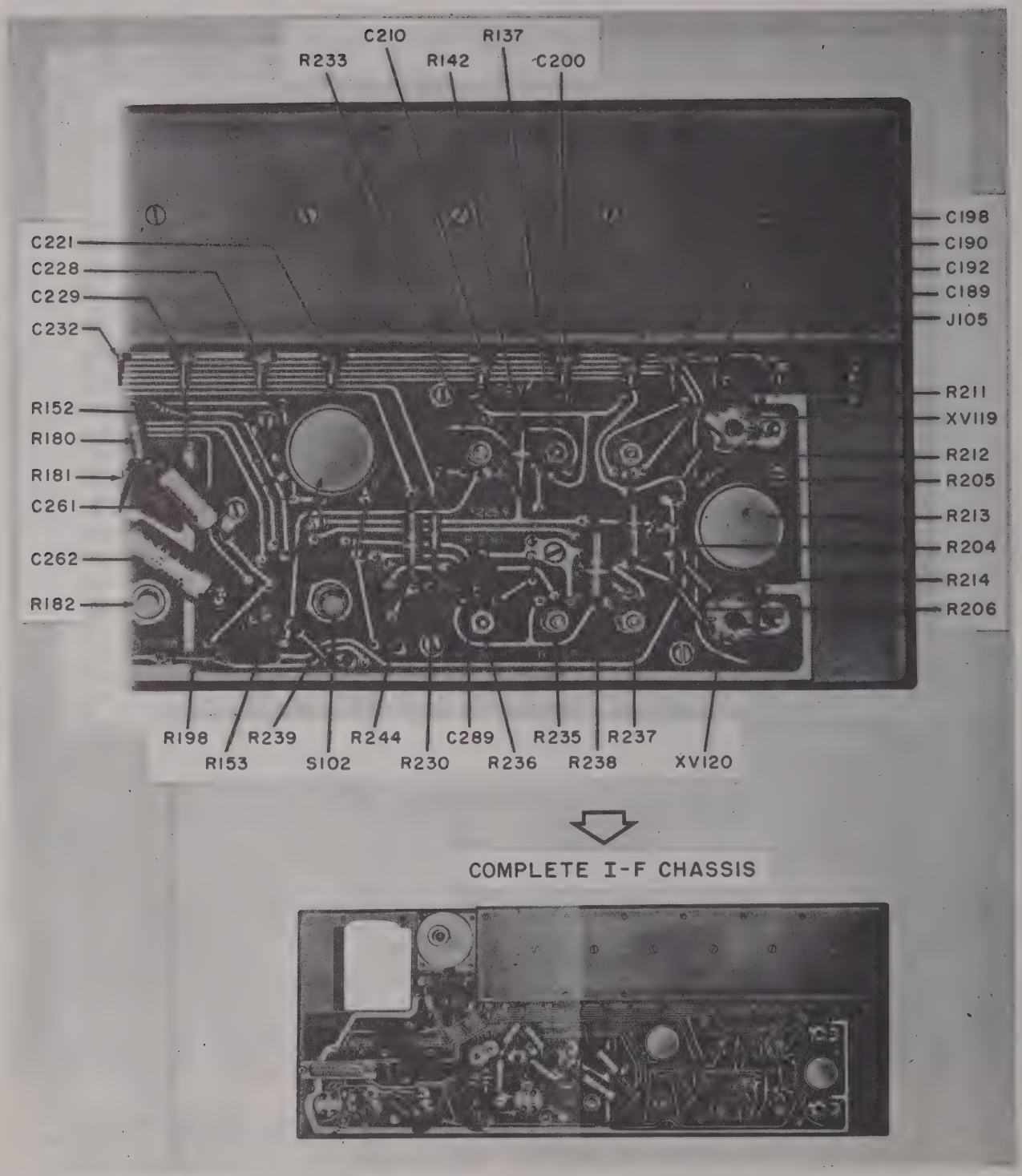


Figure 7-5. Radio Interference-Field Intensity Meter IM-88/URM-47, I-f Chassis Front View (Sheet 2 of 2 Sheets)

deposit on the contact is removed. Do *not* use sand paper, crocus, or emery cloth.

Step 5. Replace the connector body in the generator assembly; tighten with the improvised screwdriver, tighten the set screws, and connect the r-f cable to the pulse output receptacle of the impulse calibrator.

Step 6. Apply power to the equipment and check operation of the impulse calibrator. If still unsatisfactory, remove power from the equipment and proceed as below.

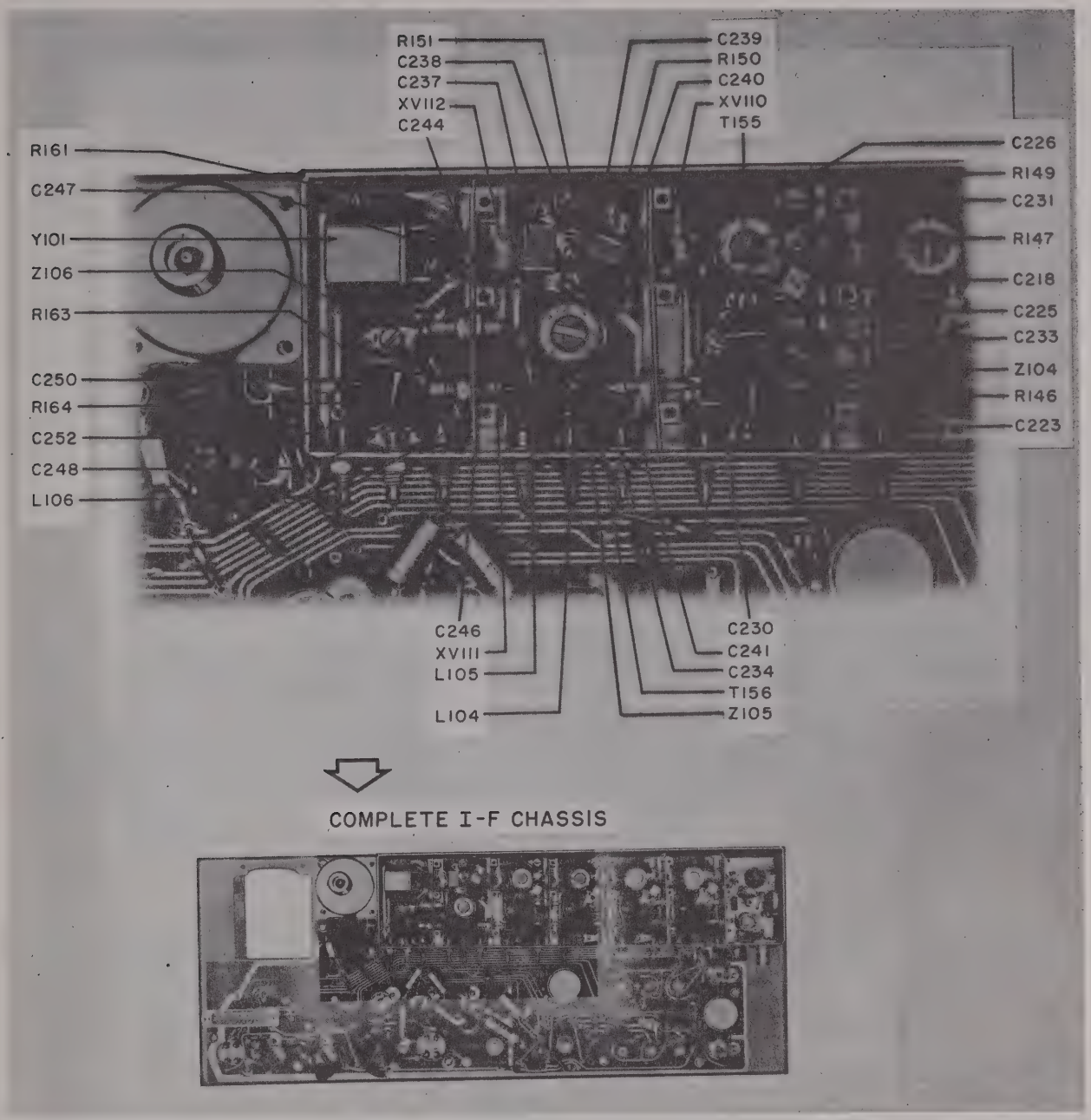


Figure 7-6. Radio Interference-Field Intensity Meter IM-88/URM-47, I-f Chassis Front View (Showing Compartments) (Sheet 1 of 2 Sheets)

Step 7. Unsolder the lead connected to the feed-through capacitor mounted on the input tube. This is on the end of the impulse calibrator assembly opposite the pulse output receptacle.

Step 8. Unscrew the feed-through capacitor and draw it straight out of the input tube. The series charging resistor and charging contact will come out with the capacitor as one assembly.

Step 9. Hold the charging contact as near the contact end as possible and burnish as outlined in Step 4 above. Be very careful not to bend or otherwise damage the contact and resistor assembly.

Step 10. Replace the assembly in the input tube and tighten the feed-through capacitor in place. Resolder the lead to the feed-through capacitor, being careful not to damage the ceramic sleeve on the capacitor.

Step 11. Apply power to the equipment and check operation of the impulse calibrator. If still unsatisfactory, proceed as outlined below.

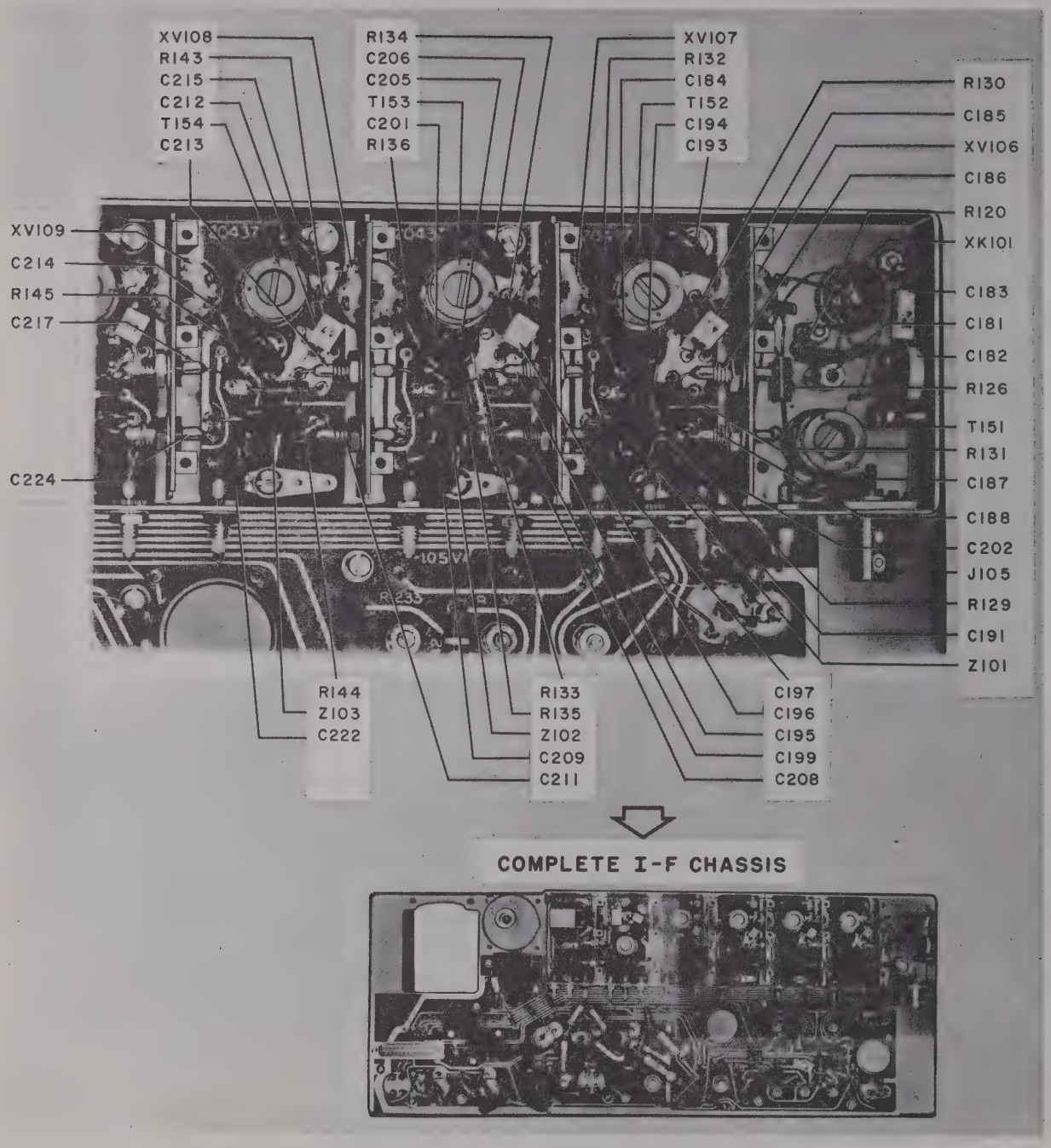


Figure 7-6. Radio Interference-Field Intensity Meter IM-88/URM-47, I-f Chassis Front View (Showing Compartments) (Sheet 2 of 2 Sheets)

Step 12. Remove power from the equipment and remove the output receptacle as outlined in Steps 1 through 3 above.

Step 13. Place a hand in front of the receptacle opening and turn the equipment over, shaking gently until the center movable contactor falls out of the impulse calibrator into the hand.

CAUTION

Exercise extreme care in handling the contactor because the very small diameter discharge contact may be broken or considerably damaged if mishandled.

Step 14. Hold the contactor in a vertical position with a light finger grip and burnish the *larger*

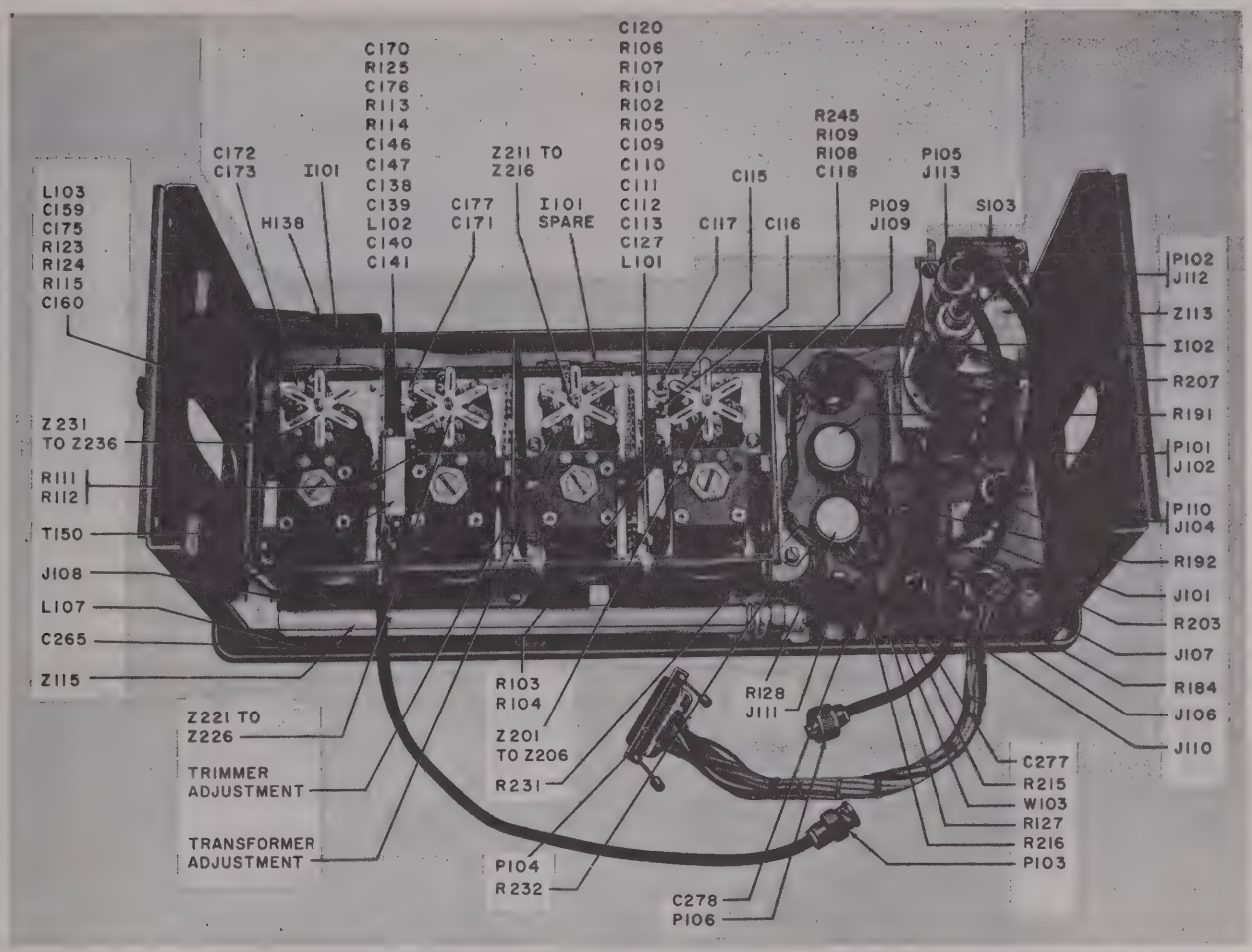


Figure 7-7. Radio Interference-Field Intensity Meter IM-88/URM-47, Chassis Rear View (I-f Chassis Removed)

of the two axially located contacts (charging contact) as outlined in Step 4 above.

Step 15. Clean the sides of the smaller discharge contact by scraping with the edge of a strip of clean white bond paper. Do *not* burnish the small diameter contact point by the procedure given in Step 4 because the point may catch on a paper surface and bend or break very easily. The small contact surface may be cleaned by carefully stroking with the edge of a piece of paper and should be inspected after cleaning with an eye-glass or microscope to make sure that no lint or other foreign particles are on the contact. Inspect the small contact with an eye-glass for a mushroomed end shape. This appearance would be the result of excessive pounding caused by too great a contact gap, in excess of 0.005 inch. If the small contact is deformed in this manner, it can be honed back to its original shape with a small, flat, fine file. Repeated inspection with an eye-glass is recommended during this operation. When completed, any metal burrs must be removed from the small contact edge and surface.

Step 16. Inspect the body of the contactor. Remove any foreign particles or surface irregularities that might impede its travel within the insulating sleeve.

Step 17. Using a pair of tweezers, return the contactor to its position in the impulse calibrator. *The large contact must enter the opening first.*

CAUTION

The contactor has a close tolerance fit within the insulating sleeve and must not be forced. If the contactor does not enter the sleeve because of incorrect alignment, touching the high outer edge will be sufficient to start entry.

Step 18. Replace the receptacle and secure as outlined in Step 5 above. Operation of the impulse calibrator should now be satisfactory, provided that spacing (or gap) between contacts has not been changed.

(*d*) ADJUSTING CONTACT SPACING. — If the tests made in accordance with subparagraph (*b*) above indicate that the gap between contacts is excessive, the adjustments outlined below should be made, after being certain that all of the contacts are free from foreign material as outlined in subparagraph (*c*) above.

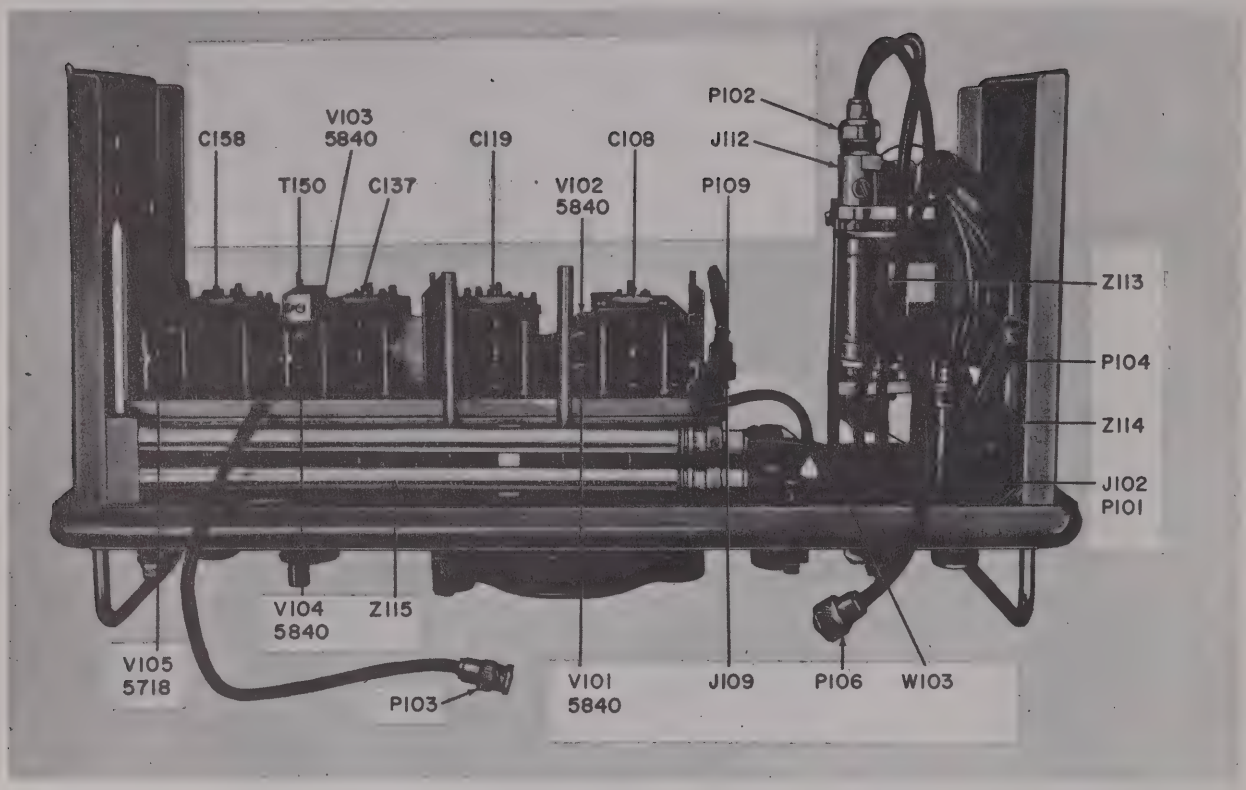


Figure 7-8. Radio Interference-Field Intensity Meter IM-88/URM-47, Chassis Bottom View (I-f Chassis Removed)

Step 1. After noting the meter scale readings for opposite charging voltage polarities as outlined in subparagraph (*b*) above, remove power from the equipment and remove the feed-through capacitor with its resistor contact assembly as outlined in Steps 7 and 8 of subparagraph (*c*) above.

Step 2. Hold the hexagonal flange of the feed-through capacitor in a vise so that the contact resistor and small sleeve used to connect the resistor lead to the feed-through capacitor extend in a horizontal direction beyond the sides of the vise. Use care in this and the following operation to prevent damage to the ceramic feed-through capacitor and to prevent misalignment of the assembly.

Step 3. Loosen the soldered joint between the resistor lead and the small sleeve that connects the resistor to the feed-through capacitor, and increase the length of the assembly very slightly by approximately three to five thousandths of an inch. This is best accomplished by heating the joint with a small soldering iron and simultaneously twisting the resistor slightly under very small axial tension with a finger grip. When the first indication of movement in the joint is observed, release the tension and twisting action so that the joint is held in position until the solder has hardened.

Step 4. Inspect the assembly for foreign material and for misalignment, cleaning, and straightening it, if necessary.

Step 5. Insert the assembly into the input tube of the impulse calibrator but do not engage the threads on the input tube and feed-through capacitor bushing by more than one turn.

Step 6. Apply power to the equipment, energize the impulse calibrator driving circuit, and carefully observe the audible noise made by operation of the generator.

Step 7. Rotate the feed-through capacitor bushing very slowly so that engagement of the threads is increased, at the same time listening to the "beats" of the generator. As the assembly is slowly screwed into the input tube, the sound of the beats will change when the spacing has been decreased so that alternate contact is made between the movable contactor and the fixed charge and discharge points. The beats will sound uniform when the movable contactor is stopped in each direction by the fixed points, and the sound will diminish as the spacing is decreased, although still maintaining uniform beats.

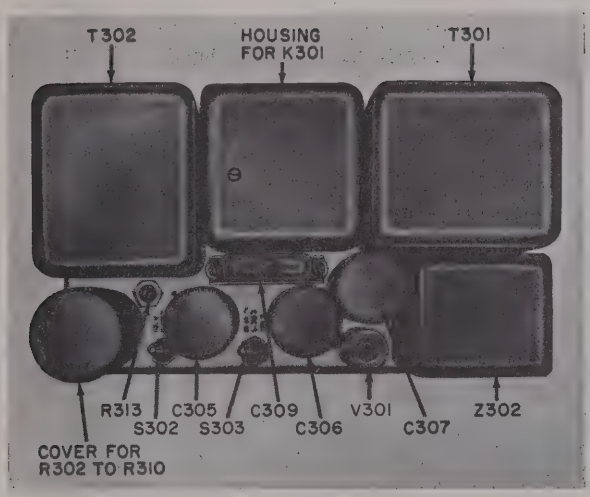


Figure 7-9. Power Supply PP-906A/URM-47, Chassis Top View

CAUTION

If the assembly has been increased in length too much by the operation of Step 3 above, the gap spacing will be reduced to zero before the feed-through capacitor is tightened in the input tube. This clamps the movable contactor between the stationary contacts and may cause damage to the small discharge contact, especially if the feed-through capacitor is tightened beyond the point where zero gap spacing occurs. A definite change in mechanical sound will be apparent as this condition is approached. Clamping the movable contactor by reducing the gap spacing to zero is to be avoided and the feed-through capacitor should be removed at once. Decrease the length of the assembly by using a technique similar to that outlined in Step 3 above, except for applying a very slight axial pressure to the resistor instead of tension.

Step 8. If the feed-through capacitor bushing can be tightened in the input tube without stopping the impulse calibrator as cautioned in Step 7 above, remove power from the equipment and resolder the charging voltage lead to the feed-through capacitor terminal.

Step 9. Apply power and check the meter scale readings for both polarities of charging voltage as outlined in subparagraphs (*b*) and (*a*) above.

Step 10. The difference between the two meter readings will be decreased from the difference noted at the beginning of these tests if the effective gap between contacts has been decreased. A difference of less than about 0.3 db may be obtained by proper adjustment of contact spacing, assuming that all other checks outlined above have been made, and that the opposite polarity charging voltages are very nearly equal.

Step 11. If the difference in meter readings is more than about 0.3 db for opposite charging polarities, the above procedure should be repeated until proper contact spacing is obtained.

(4) REPLACEMENT OF PARTS. — Defective parts should be replaced with correct replacement parts as listed in Section 8. Upon removing the defective part, install the replacement part in the exact position of the original part. Keep the leads on the replacement part the exact length of those on the original part.

When coaxial connectors have been disconnected during maintenance procedures, securely tighten the connectors before placing the RI-FI Meter in service. This is extremely important in order to avoid discontinuity at the coaxial connector which adversely affects the standing wave ratio on the coaxial line.

(5) REPAINTING. — The paint on the instrument case and accessories may require touch-up work. Paint specifications used on the equipment are as follows:

(*a*) Equipment cases and protective covers—Specification MIL-E-15090, Type III, Class II.

(*b*) Antenna element identification color bands-two coats of Dupont Dulux, 93 line enamel (or equivalent) in the following color order were applied over one coat of Dupont Preparakate No. 65-1055 gray primer (or equivalent):

23-½ in. element	No. 93-2622R	Red
16-1/4 in. element	No. 93-5248	Yellow
23-1/2 in. tapered element	No. 93-1650	Green
Long telescopic element	No. 93-3430	Blue
Short telescopic element	No. 93-21667	White

7-5. POWER SUPPLY PP-906A/URM-47 TROUBLE SHOOTING AND REPAIR.

a. TROUBLE SHOOTING DATA.—
Schematic Diagram—Figure 7—14
Practical Wiring Diagram—Figure 7—13
Voltage and Resistance Data—Figure 7—11
Component Locations—Figures 7—9 and 7—10
Winding Data—Table 7—4

b. REPAIR AND ADJUSTMENT DATA.

(1) TUBE CHANGE.—Any of the tubes in the power supply can be replaced without affecting the calibration of the RI-FI Meter. It would be wise, however, to check the output voltage of the power supply under load after tubes have been replaced. Tube locations are shown in figure 5—2.

Tube clamps employed in this unit can be operated with the fingers, or by means of a screwdriver inserted in the slot of the clip.

(2) VOLTAGE ADJUSTMENT.—The required value of B+ output voltage is determined by the set-

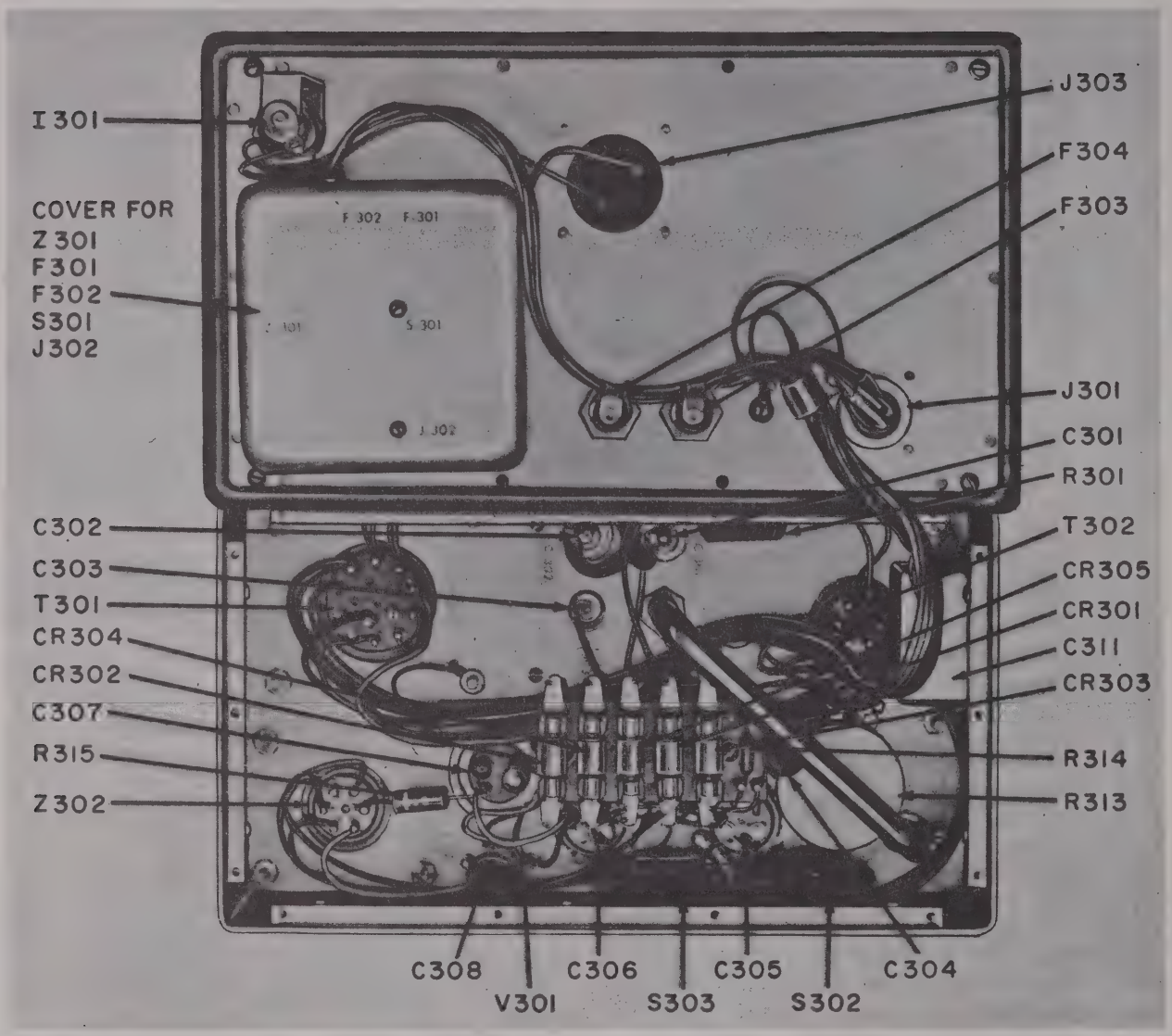


Figure 7-10. Power Supply PP-906A/URM-47, Chassis Bottom View

ting of the regulator adjustment control R313. The input power line voltage should be adjusted to 115 volts. Connect the RI-FI Meter to the power supply to provide the proper load conditions. Remove the power supply chassis from the case. Remove the RI-FI Meter from its case. Connect a 20,000-ohm-per-volt multimeter, such as model AN/PSM-4 series or equivalent, between J106, pin B, and chassis. Adjust R313 for a reading on the voltmeter of +225 volts.

Note

Check that the output at i-f chassis receptacle J106, pin A, to chassis is 6.3 volts ac. Also check the bias supply (−105 volts dc) at this time using a 20,000-ohms-per-volt multimeter connected between J106, pin C, and chassis.

7-6. EQUIPMENT REQUIRED FOR ALIGNMENT AND ADJUSTMENT.

a. RADIO INTERFERENCE MEASURING SET AN/URM47 UNITS.—

Radio Interference-Field Intensity Meter IM-88/URM-47

Power Supply PP-906A/URM-47

A-c Power Cable Assembly CX-3810/U (6′ 6″)

Power Cable Assembly 91487-1 (10′ 0″)

R-f transmission line Cable Assembly CG-92D/U (20′ 0″)

Coaxial cable patch cord comprising RG-58/U or RG-58A/U cable with connector types UG-29/U and UG-201/U

Headphones Navy Type —49753 or equivalent

Alignment Tool H109 (located in RI-FI Meter, see figure 5–5)

b. TEST AND MISCELLANEOUS EQUIPMENT. *(See table 7–1.)*–

Signal Generator TS-497/URR or Measurements Corporation Model 80, or equivalent high-impedance input

Vacuum Tube Voltmeter, Measurements Corporation Model 62, or equivalent

6-db, 50-ohm pad for output termination of signal generator

7-7. SET-UP OF EQUIPMENT FOR ALIGNMENT AND ADJUSTMENT PROCEDURES.

Note

Before commencing alignment and adjustment of this equipment, check the mechanical zero setting of the front panel meter. It is possible that correcting this zero setting will correct the symptoms of misalignment or maladjustment and the equipment can be returned to service.

Step 1. Remove the RI-FI Meter from its case (paragraph 5-2) and set up on a bench or table.

Step 2. Interconnect the RI-FI Meter and the power supply by means of Power Cable Assembly 91487-1 (10′ 0″). Turn the POWER switch S301 to the OFF position.

Step 3. Connect the power supply to a source of 115 volts ac, preferably 60 cps, by means of the a-c Power Cable Assembly CX-3810/U (6′ 6″). Ground the clip at the input end of this cable.

Note

Check that switch S302 located on the power chassis is set for 115 volts and that the metal reminder tag on the front panel is likewise set.

7-8. ALIGNMENT AND ADJUSTMENT PROCEDURES.

a. PRELIMINARY CHECKS PRIOR TO ACTUAL ALIGNMENT.–Turn the power supply POWER switch S301 to the ON position.

Note

Allow a one-hour warm-up period before commencing alignment and adjustment procedures. The locations of screwdriver controls referred to in the following procedures are shown in figures 7–4 through 7–8. Various mechanical adjustments referred to herein are located on figures 7–4 and 7–7.

Check the following voltages at the points indicated:

(1) B+ (+225 volts). Check at the POWER receptacle J106, pin B, located on the RI-FI Meter.

(2) Bias supply (–105 volts): Check at the POWER receptacle J106, pin C.

(3) Filament supply (6.3 volts ac): Check at the POWER receptacle J106, pin A.

b. PRELIMINARY METER TRACKING ADJUSTMENT.

(1) ADJUSTMENT OF ELECTRICAL ZERO.

Step 1. Set function switch S102 to the BFO position.

Step 2. Set the Adj. Zero control R213 for a zero meter reading.

Note

All screwdriver controls contain a locking nut which must be loosened to allow adjustment of the control. The locking nut must be tightened after adjustment.

(2) CHECK FOR GAS CURRENT.

Step 1. Set up the following operating controls:

Attenuator (A)	CAL
Function Switch (B)	FIELD INTENSITY
Tuning dial frequency (H)	Any

Step 2. Turn the FI-10 control R137 and the FI-Buck control R235 to maximum counterclockwise positions. The meter indication should not go below zero. If it does, gas current is present in V119. Replace V119 with a tube that does not contain gas current.

Step 3. Adjust the meter zero as in subparagraph *b.*(1), preceding.

(3) PRELIMINARY ADJUSTMENT OF FI-10 CONTROL.

Step 1. Set up the following operationg controls:

Attenuator (A)	CAL
Function switch (B)	FIELD INTENSITY
Dial frequency (H)	Any

Step 2. Using the 20,000-ohm-per-volt multimeter such as AN/PSM-4 or equivalent (see table 7–1), connect the negative lead to the chassis (ground) and the positive lead to the arm of the FI-10 control R137. (See figure 7–14.) Adjust the FI-10 for a meter indication of approximately 4 volts dc.

(4) PRELIMINARY ADJUSTMENT OF DIODE BUCKING VOLTAGE.

Step 1. Set up the following operating controls:

Attenuator (A)	CAL
Function switch (B)	FIELD INTENSITY
Dial frequency (H)	Any
CALIBRATE (D)	Fully counterclockwise

Step 2. Adjust the FI-Buck control R235 to provide approximately 1 per cent (1/16-inch) deflection of panel indicating meter M101.

c. INTERMEDIATE FREQUENCY ALIGNMENT.

(1) SET-UP OF EQUIPMENT FOR I-F ALIGNMENT.

Step 1. Remove i-f amplifier chassis from gusset plates (two Dzus fasteners, AUDIO and function switch shaft couplings, and r-f attenuator screws).

Step 2. Disconnect P103 from J105.

Step 3. Connect output of signal generator to i-f amplifier input connector J105 using r-f transmission line Cable Assembly CG-92D/U (20′ 0″), coaxial cable patch cord, and conncetors type UG-29/U and UG-201/U.

Step 4. Plug headphones into PHONES receptacle J108.

Step 5. Energize equipment.

(2) ALIGNMENT OF I-F TRANSFORMERS.

Step 1. Set up the following operating controls:

Attenuator (A)	X1
Function switch (B)	As called for
CALIBRATE (D)	Fully clockwise
AUDIO (F)	Fully clockwise

Step 2. Adjust signal generator frequency to BFO frequency, modulation off. This can be done by setting function switch to BFO position and tuning signal generator in vicinity of 15 megacycles for a beat note as heard in headphones.

Step 3. Turn function switch to FIELD INTENSITY position. Adjust signal generator output and CALIBRATE control (D) for an up-scale reading on output meter M101.

Step 4. Using 3/16-inch nut wrench, adjust i-f transformers T151 through T156 for maximum indication of M101, readjusting CALIBRATE control as needed to maintain an "on scale" reading.

d. FINAL METER TRACKING ADJUSTMENTS.

(1) SET-UP OF EQUIPMENT FOR METER TRACKING ADJUSTMENTS.—Use set-up described in i-f alignment, paragraph 7-8.*c.*(1), preceding.

(2) ADJUSTMENT OF THE FI-10, FI-100, AND FI-BUCK CONTROLS.

Step 1. Set up the following operating controls:

Attenuator (A)	X1
Function switch (B)	FIELD INTENSITY
CALIBRATE (D)	As called for

Step 2. With signal generator still at BFO frequency and with internal modulation off, adjust output to 50-microvolt level. Adjust CALIBRATE control so that M101 indicates 1 microvolt.

Step 3. Increase output of signal generator to 5000 microvolts. Adjust FI-100 control R211 so that M101 reads full scale, 100 microvolts.

Step 4. Decrease signal generator output to 50 microvolts and readjust CALIBRATE control (D) for 1-microvolt reading.

Step 5. Repeat Steps 2 through 4 until both points fall into place without further adjustment.

Step 6. Set signal generator output to 500 microvolts. M101 should indicate 10 microvolts. If not, adjust FI-10 control R137 for M101 indication of 10 microvolts. If error is one or more microvolts, move meter reading beyond 10 microvolts a few divisions. For example, if meter M101 indicates 13 microvolts instead of the correct value of 10, adjust the FI-10 control R137 for a meter reading of approximately 8 microvolts and vice versa. Then repeat Steps 1 through 6 until meter tracks at 1, 10, and 100 without further adjustment.

Note

Check adjustment of electrical zero occasionally, function switch at BFO position. Check adjustment of diode bucking voltage (see paragraph 7-8.*b.*(4); this should be done occasionally.

Step 7. Repeat Steps 1 through 6 and note until meter tracks.

Step 8. Tighten lock nuts on R137, R235, and R211.

(3) ADJUSTMENT OF QP1 AND QP 100 CONTROLS.

Step 1. Set up the following operating controls:

Attenuator (A)	X1
Function switch (B)	As called for
CALIBRATE (D)	As called for

Step 2. With function switch in FIELD INTENSITY position, adjust signal generator output (unmodulated) to 5000 microvolts. Adjust CALIBRATE control (D) for M101 indication of 100 microvolts. Change function switch (B) to QUASI PEAK position. Adjust QP 100 control R233 for output meter indication of 100 microvolts.

Step 3. With function switch (B) in FIELD INTENSITY position, adjust signal generator output (unmodulated) to 50 microvolts. Adjust CALIBRATE control (D) for M101 indication of 1 microvolt. Change function switch (B) to QUASI PEAK position. Adjust QP1 control R236 for output meter indication of 1 microvolt.

Step 4. Repeat Steps 2 and 3 until the indications on the FIELD INTENSITY and QUASI PEAK functions agree without further adjustment. Then compare readings at mid-scale deflection; there should be little difference.

Step 5. Tighten lock nuts on R233 and R236.

(4) ADJUSTMENT OF PEAK BUCK CONTROL.

Step 1. Set up the following operating controls:

Attenuator (A)	X1
Function switch (B)	As called for
PEAK (C)	As called for
CALIBRATE (D)	As called for
PEAK SENS. (E)	Fully counterclockwise
AUDIO (F)	Fully clockwise

Step 2. Set function switch (B) to QUASI PEAK position. Adjust signal generator output to 50 microvolts with 30 per cent modulation (1000 cycles) and adjust CALIBRATE control (D) for M101 indication of 1 microvolt.

Step 3. Set function switch (B) to PEAK. Adjust PEAK control (C) for M101 indication of 1 microvolt. Adjust Peak Buck control R237 to position where the 1000-cycle audible signal just disappears.

Step 4. Set function switch (B) to QUASI PEAK position. Adjust signal generator output to 5000 microvolts with 30 per cent modulation (1000 cycles) and adjust CALIBRATE control (D) for M101 indication of 80 microvolts.

Step 5. Set function switch (B) to PEAK position. Adjust PEAK control (C) to position where the 1000-cycle audible signal just disappears. Note M101 indication; it should be 80 microvolts. If other than 80 microvolts, repeat Steps 1 through 5 for greater accuracy. If too great an error still exists, replace fixed resistor R239 with larger resistance to lower reading or a lower value to increase reading. (An alternate correction is to replace V109 with a tube of more suitable gain characteristics, but this would require rechecking and possible realignment starting with paragraph 7-8.*c*.)

Step 6. Tighten lock nut on R237.

(5) ADJUSTMENT OF DYNAMIC RANGE (OVERLOAD CAPACITY) CONTROL.

Step 1. Set up the following operating controls:

Attenuator (A)	X1
Function switch (B)	FIELD INTENSITY
PEAK (C)	As called for
CALIBRATE (D)	As called for

Step 2. With power turned OFF, temporarily disconnect the wire that connects C200 and passes through eyelet on printed circuit board. Temporarily add a jumper from C200 to the junction of C289 and R230.

Step 3. Connect a high-impedance vacuum tube voltmeter between chassis (positive) and C200 (negative). Turn power ON and allow equipment to warm up. Adjust PEAK control (C) for 100 microvolts deflection of output meter M101. Note voltage reading on VTVM.

Note

If the voltage on the VTVM exceeds 5 volts, difficulty may be experienced in adjusting for 20 db dynamic range in Steps 5 and 6, following. This voltage level is established when adjusting FI-100 control R211 during meter scale tracking procedure. By allowing the "10 microvolt" point to fall a little low when meter scale tracking (see paragraph 7-8.*d*), the above voltage will be decreased.

Step 4. Connect VTVM between chassis (positive) and junction of C254 and C266 (negative).

Step 5. Adjust signal generator output to 1000 microvolts. Adjust CALIBRATE control for same indication on VTVM as noted in Step 3.

Step 6. Increase signal generator output by 20 db (10 times or to 10,000 microvolts). The VTVM reading should be 9 times original reading (10 per cent down from linearity). (For example, if at start 1000 microvolts input provided 4 volts output, then, with 10,000 microvolts input, there should be $9 \times 4 = 36$ volts output.) If VTVM reading is other than 9 times, adjust Dynamic Range control R153 clockwise if the reading is low, and counterclockwise if reading is high. Repeat Steps 5 and 6 until no further adjustment is required.

Step 7. Remove temporary jumper from C200 to junction of C289 and R230 and resolder wire to C200.

Step 8. Tighten lock nut on R153.

Note

The final adjustment procedures of T150, T151, and attenuator step position X10 are given in paragraph 7-8.*f*. These final adjustments are performed after the r-f alignment procedures.

e. R-F ALIGNMENT.

(1) SET-UP OF EQUIPMENT FOR R-F ALIGNMENT.

Step 1. Set up the equipment as described in paragraph 7-7.

Step 2. Plug headphones into PHONES receptacle J108 on the RI-FI Meter front panel.

Step 3. Insert the coaxial cable patch cord and the 6-db, 50-ohm pad in series with Cable Assembly CG-92D/U (20′ 0″) (between the signal generator and the RI-FI Meter).

Step 4. Connect the signal generator to an external source of 110 volts, 60 cps. Turn the signal generator power switch to its on position.

Note

Frequency calibration of the signal generator should be checked with a suitable frequency meter such as frequency meter LM series or frequency meter AN/USM-29 series. The accuracy of frequency calibration should be within ±2 per cent.

Step 5. Turn the power supply POWER switch S301 to its ON position and allow a reasonable time for both the signal generator and the RI-FI Meter to reach stable operating temperature before beginning these alignment procedures.

(2) POSITION OF OPERATING CONTROLS.–

Attenuator (A)	X1
Tuning dial (H) frequency	As called for
BAND SWITCH (G)	As called for
Function switch (B)	FIELD INTENSITY
CALIBRATE (D)	As called for
AUDIO (F)	Comfortable headphone level

Note

The function switch (B) on the RI-FI Meter should be in any position except CAL, preferably in the FIELD INTENSITY position, since there is no point in allowing the internal calibrator to operate during the warm-up period.

(3) ALIGNMENT OF R-F CIRCUITS.–

CAUTION

The position of the BAND SWITCH (G) should not be changed after making trimmer slug alignments without being certain that the adjustment screws do not extend beyond the inner surface of the shield cover. Damage to the coil or turret assemblies may result if precaution is not observed.

(a) HIGH FREQUENCY END, BAND 1.

Step 1. Set BAND SWITCH (G) on Band 1, set TUNING dial (H) on 33 megacycles, and set the CALIBRATE control (D) for a reading of approximately 1 on the microvolts scale of the output indicator meter M101.

Step 2. Adjust the signal generator for an unmodulated 33-megacycle signal output so that a usable scale reading (approximately half or three-quarters full scale) is obtained on meter M101.

Step 3. Adjust the oscillator trimmer capacitor C161 (part of Z231, see figure 7–7) for maximum deflection of the output meter. (It may be necessary to readjust the signal generator output level to keep the output meter reading less than full scale.)

TABLE 7-2. R-F ALIGNMENT CHART (BANDS 1 THROUGH 6)

CAUTION

Do not turn the tuning slugs more than one complete turn in either direction without being certain that the adjustment is being made in the right direction and that the screw will clear the shield cover when the turret is rotated.

BAND NO.	HIGH END POINTS					LOW END POINTS				
	SIGNAL FREQUENCY (mc)	TRIMMER ADJUSTMENTS				SIGNAL FREQUENCY (mc)	SLUG ADJUSTMENTS			
		OSC.	MIXER	R-F PLATE	ANT.		OSC.	MIXER	R-F PLATE	ANT.
1	33.0	C161	C131	C121	C101	20.0	T131	T121	T111	T101
2	54.0	C162	C132	C122	C102	33.0	T132	T122	T112	T102
3	88.0	C163	C133	C123	C103	54.0	T133	T123	T113	T103
4	145.0	C164	C134	C124	C104	88.0	T134	T124	T114	T104
5	240.0	C165	C135	C125	C105	145.0	T135	T125	T115	T105
6	400.0	C166	C136	C126	C106	240.0	T136	T126	T116	T106

Notes: 1. The oscillator frequency is 15 megacycles above the signal frequency in all bands.

2. Trimmer and slug adjustments are made through small access holes in rear of the r-f shield cover with the BAND SWITCH set on the given position.

3. Trimer capacitor adjustment screws are located in bottom position (nearest variable tuning capacitor) and inductance slug adjustment screws are in top position (nearest to turret shaft) of the r-f shield cover with the RI-FI Meter in normal position. (See figure 7-7.)

CAUTION

Do not turn trimmer slugs more than one complete turn in either direction without being certain that the adjustment is being made in the right direction and the screw will clear the shield cover when the coil turret is rotated.

Step 4. Adjust the mixer trimmer capacitor C131 (part of Z221, see figure 7–7) for maximum output on meter M101.

Step 5. Adjust the r-f amplifier plate circuit trimmer capacitor C121 (part of Z211, see figure 7–7) for maximum deflection of the output meter.

Step 6. Adjust the antenna circuit trimmer capacitor C101 (part of Z201, see figure 7–7) for maximum meter deflection.

Step 7. Recheck the adjustment of trimmer capacitors C161, C131, C121, and C101 to be certain that all circuits are peaked for maximum output.

(b) LOW FREQUENCY END, BAND 1.–

Step 1. Set the TUNING dial for a frequency of 20 megacycles (low end of Band 1) and readjust the CALIBRATE control for a reading of approximately 1 microvolt on the output meter M101.

Step 2. Adjust the signal generator for an unmodulated 20-megacycle signal at an output level sufficient to provide a usable deflection on the output meter.

Step 3. Adjust the tuning slug in the oscillator transformer T131 (part of Z231, see figure 7–7) for a maximum output reading on the meter.

CAUTION

Do not turn the tuning slugs more than one complete turn in either direction without being certain that the adjustment is being made in the right direction and that the screw will clear the shield cover when the turret is rotated.

Step 4. Adjust the tuning slugs in the transformers in the mixer grid circuit T121 (part of Z221), the r-f amplifier plate circuit T111 (part of Z211) and the antenna circuit T101 (part of Z201, see figure 7–7), in the order given for maximum output indication.

Step 5. Recheck the adjustments of the transformer slugs of T131, T121, T111, and T101 to be certain that maximum output is obtained.

(c) Repeat subparagraphs 7-8.*e.*(3).*(a)* and 7-8.*e.*(3).*(b)*, immediately preceding, until no further adjustments are necessary.

(d) BANDS 2 TO 6.—Bands 2 through 6 are aligned in the same manner as given previously for Band 1, with the proper settings of the high and low end frequencies. Refer to table 7–2 for the adjustment frequencies and circuit adjustments for all bands.

Note

The following notes apply to the alignment of Band 6 only. The range of adjustments of the trimmer capacitor C166 and the inductance slug on the oscillator transformer T136 may be sufficient to place the oscillator frequency 15 megacycles below the signal frequency under certain conditions of adjustment. For example, the oscillator could be 15 megacycles above the signal frequency at the low end of Band 6 and 15 megacycles below the signal frequency at the high end of Band 6. This would cause mistracking over the band, with resultant poor sensitivity. If there is reason to believe that the oscillator is 15 megacycles below the signal frequency, the oscillator frequency should be checked with an instrument having a suitable frequency range such as a grid-dip meter or frequency meter. An alternate method of checking the oscillator frequency is to check the frequency of the i-f image response, which should be 30 megacycles above the signal frequency in all cases. Alignment of the mixer grid circuit on the high end of Band 6 (C136) may cause a slight shift in the oscillator frequency ("pulling") in some cases. The oscillator trimmer C166 should be reset, if necessary, after adjusting the mixer grid trimmer C136 and before adjusting the r-f amplifier plate circuit trimmer C126.

f. FINAL ADJUSTMENT OF T150, T151, AND ATTENUATOR STEP X10.–

Note

This subparagraph presupposes that the r-f alignment has been completed.

Step 1. Set up the following operating controls:

Attenuator (A)	As called for
Function switch (B)	FIELD INTENSITY
CALIBRATE (D)	As called for
Tuning dial frequency (H)	As called for

Step 2. Set up the equipment as indicated in paragraph 7-7. Connect the signal generator to J101 using the r-f transmission line Cable Assembly CG-92D/U (20′ 0″).

Step 3. Tune signal generator to 20 megacycles and adjust the output to 100 microvolts. Set the attenuator (A) to its X1 position. Tune the r-f head for maximum response to the 20-megacycle signal and adjust the CALIBRATE control (D) for an "up-scale" indication on output meter M101.

Step 4. Tune transformer T150 (see figure 7–8) with the alignment tool (see figure 5–5) and trans-

former T151 (see figure 7—4) with a 3/16-inch nut wrench for maximum indication on M101; readjust the CALIBRATE control (D) as needed to maintain an "on scale" reading.

Step 5. Set the attenuator (A) to its X10 position. Tune C181 (figure 7—4) for maximum response on M101. Repeat Steps 3 to 5 until no further adjustment is necessary.

Step 6. Change the attenuator (A) setting back to the X1 position. Adjust the CALIBRATE control (D) for an output meter indication of 100 microvolts. Then increase the signal generator output by 10 times (20 db) or to 1000 microvolts. Switch attenuator (A) to its X10 position. Output meter indication should again be 100 microvolts. If attenuator step X10 does not provide 20 db of attenuation, change setting of C182 (figure 7—6) (increase capacitance for less attenuation and decrease capacitance for more attenuation) and repeat Steps 3 through 6. Repeat as often as required to achieve 20 db of attenuation between the X1 and X10 attenuator steps.

7-9. CORRECTING CHART SET PT-188/URM-47 AFTER ALIGNMENT.

a. GENERAL.—Data plotted on all charts of Chart Set PT-188/URM-47 have been plotted for the individual equipment as shipped. Upon completing the maintenance procedures described in paragraph 7-8, it is necessary to obtain new data and plot these charts accordingly. The original plot can be erased and new curves drawn in with pencil or draftsman's pen. If the overall bandpass of the equipment is the same as before and an accurate signal generator is used, it is possible that the original data will be closely repeated and redrawing of the charts thus becomes unnecessary.

After the RI-FI Meter has been aligned in accordance with the instructions in paragraph 7-8, obtain data for Chart Set PT-188/URM-47 at each of the following calibrating frequencies:

BAND	*FREQUENCIES (mc)*
1	20, 23, 26, 29, 33
2	33, 37, 42, 48, 54
3	54, 62, 70, 80, 88
4	88, 100, 115, 130, 145
5	145, 170, 195, 220, 240
6	240, 280, 320, 360, 400

b. CALIBRATING PROCEDURE.

(1) CHART NO. 6 AND NO. 7 (EFFECTIVE "RANDOM INTERFERENCE" BANDWIDTH). — The overall bandwidth of the RI-FI Meter is influenced by the selectivity of the r-f tuned circuits; therefore, bandwidth data must be taken at radio frequencies listed immediately preceding.

Step 1. Set up the following operating controls:

Attenuator (A)	X1
Function switch (B)	FIELD INTENSITY
CALIBRATE (D)	As called for

Step 2. Connect output of Signal Generator AN/URM-26 to J101 using r-f transmission line Cable Assembly CG-92D/U (20′ 0″).

Step 3. Adjust signal generator frequency to 20 megacycles. Adjust output to 1000 microvolts.

Step 4. Tune RI-FI Meter for maximum response to test signal. Adjust CALIBRATE control (D) for M101 indication of 60 microvolts.

Step 5. Increase signal generator output by exactly 3.7 db (1.53 times).

Step 6. Decrease the signal generator frequency to about 18 megacycles, then slowly increase the frequency beyond 20 megacycles. Observe the two signal generator frequencies at which M101 indicates 60 microvolts. Record the difference in frequency between the two observed points; this is the overall effective "Random Interference" bandwidth at this test frequency.

Note

In order to counteract backlash in the signal generator tuning mechanism, always sweep the signal generator frequency continuously in one direction from a point below the calibrating frequency upward to a point above the calibrating frequency. The two frequencies will be quite close together so use the vernier markings on the signal generator tuning knob for accurate readings.

Step 7. Repeat Steps 3 through 6 for each of the test frequencies.

Step 8. Using the vertical scale of Chart No. 6 and No. 7, plot the points of 3.7-db bandwidth determined in Step 6. Draw a smooth curve through the plotted points.

(2) CHART NO. 1 AND NO. 2 CALIBRATION SETTINGS.

Step 1. Set up the following operating controls:

Attenuator (A)	As called for
Function switch (B)	As called for
PEAK (C)	As called for
PEAK SENS. (E)	As called for
Tuning dial frequency (H)	As called for

Step 2. Using Cable CG-92D/U (20′ 0″), connect the RI-FI Meter to output of Signal Generator TS-497/URR.

Note

The absolute value of calibration depends on the accuracy of the calibrating source.

Step 3. Adjust signal generator frequency to 20 megacycles. Adjust output to 100 microvolts.

TABLE 7-3. ELECTRON TUBE OPERATING VOLTAGES

Note

1. All numbers within parentheses designate pin numbers.
2. All measurements are made with a 20,000 ohm/voltmeter and with attenuator on X1; function switch on FIELD INTENSITY; PEAK, CALIBRATE, PEAK SENS., and AUDIO controls in their maximum counterclockwise positions unless otherwise indicated.
3. The above voltages are typical and will vary with different units.
4. All measurements are made from point indicated to chassis, except heater voltages which are measured across tube socket heater connections.

SYMBOL	TUBE	FUNCTION	PLATE (Voltage)	SCREEN (Voltage)	SUPP. (Voltage)	CATHODE (Voltage)	GRID (Voltage)	HEATER (Voltage)
V101	5840	R-f Amplifier	88	86	0	0	—0.65	6.3
V102	5840	R-f Amplifier	88	86	0	0	—0.3	6.3
V103	5840	Mixer	66	25	0	0	—0.2	6.3
V104	5840	Mixer	66	25	0	0	—0.2	6.3
V105	5718	Local Oscillator	126	—	–	0	—0.15	6.3
V106	6BH6	1st I-f Amplifier	220	212	0	12	0	6.3
V107	6BH6	2nd I-f Amplifier	220	185	0	4.4	0	6.3
V108	6BH6	3rd I-f Amplifier	220	188	0	4.4	0	6.3
V109	6BH6	4th I-f Amplifier	220	163	0	1.3	0	6.3
V110	6005/6AQ5W	5th I-f Amplifier	205	196	13	13	0	6.3
V111	5726/6AL5W	Detector	***(2) —0.1 (7) —0.05	—	–	(1) 0.45 (6) 0.45	—	6.3
V112	6C4	BFO	*128	—	–	*0	*0.75	6.3
V113	6AU6WA	Video Amplifier	123	156	0	1.55	0	6.3
V114	6C4	Audio Amplifier	218	—	–	7.3	0	6.3
V115	6BH6	Pulse Amplifier	218	155	0	1.1	0	6.3
V116	5814A	Trigger Multivibrator	(1) 112 (6) 223	—	–	(3) 47 (8) 47	(2) 36 (7) 18	6.3
V117	6BH6	Pulse Amplifier	222	223	0	0	—39	6.3
V119	6C4	VTVM	110	—	–	3.5	0	6.3
V120	6C4	VTVM	110	—	–	3.5	0	6.3
V121	5814A	Impulse Generator	**(1) 150 (6) 150	—	–	**(3) —76 (8) —76	**(2) —40 (7) —72	6.3
V122	OA2WA	Voltage Regulator	150	—	–	0	—	—
V301	OB2WA	Voltage Regulator	0	—	–	—108	—	—

*Function switch in BFO position.

**Function switch in CAL position.

***Function switch in QP position.

Step 4. Set RI-FI Meter attenuator (A) to X1 position, function switch (B) to FIELD INTENSITY position. Tune RI-FI Meter for maximum response to test signal. Adjust CALIBRATE control (D) for M101 indication of 100 microvolts.

Step 5. Turn attenuator (A) to CAL position. Set function switch (B) to CAL position. Turn PEAK control (C) maximum clockwise.

Step 6. Rotate PEAK SENS. control (E) clockwise until visual PEAK indicator I102 glows. Then rotate PEAK SENS. control (E) counterclockwise until I102 just ceases to light. (The visual null circuit is now adjusted to its most sensitive operating point for the detection of the calibrator pulse.)

Step 7. Turn PEAK control (C) counterclockwise until the visual PEAK indicator I102 blinks in unison with pulses emitted by calibrator (headphones may be used for aural identification). Then rotate PEAK control clockwise until I102 just ceases to blink. Note M101 indication on db scale and record.

Note

The aural null method may be used to verify visual null measurement of calibrator pulse amplitude.

Step 8. Repeat Steps 3 through 7 for each of the test frequencies in Bands 1 through 4.

Step 9. Using vertical scale of Charts No. 1 and No. 2, plot the values of calibrator pulse amplitude in db which were determined in Step 7. Draw a smooth curve through the plotted points.

Step 10. Repeat Steps 3 and 4 at the test frequency of 145 megacycles in Band 5. Then reduce signal generator output to zero. If M101 indication is less than one microvolt, use 100-microvolt signal generator output as suggested in Step 3. If M101 indication is greater than one microvolt, use a signal generator output of 200 microvolts in Step 3.

Step 11. Repeat Steps 3 through 7 for each of the test frequencies in Band 5, but using signal generator output indicated by Step 10. If 100 microvolts are used, the correction factor for Band 5 will be 1. If 200 microvolts are used, the correction factor for Band 5 will be 2.

Step 12. Using the vertical scale of Charts No. 1 and No. 2, plot the values of calibrator amplitude in db which were determined in Step 7. Draw a smooth curve through the plotted points.

Step 13. For test frequencies in Band 6, a different procedure will be used as the sensitivity will not reach the 1-microvolt level.

To achieve maximum sensitivity capabilities of this band, operate with a signal-to-noise ratio of unity. This means the noise level will be maintained at 1 microvolt.

Take data as follows:

Step *a.* Attenuator control (A) to CAL position.

Step *b.* Function switch (B) to CAL position.

Step *c.* Adjust CALIBRATE control (D) to extreme counterclockwise position.

Step *d.* Rotate PEAK control (C) for output meter indication of approximately full scale.

Step *e.* Turn PEAK SENS. control (E) clockwise until PEAK indicator lamp glows. Then counterclockwise until the lamp just ceases to glow.

Step *f.* Turn function switch (B) to FIELD INTENSITY position.

Step *g.* Adjust CALIBRATE control (D) for an indication of 1 microvolt on output meter.

Step *h.* Turn function switch (B) to CAL position.

Step *i.* Adjust PEAK control (C) counterclockwise until indicator lamp blinks at calibrator pulse frequency. Then turn clockwise until lamp just ceases to blink. Note M101 indication on db scale and record.

Step *j.* PULL-TURN-PUSH attenuator (A) to X1 position.

Step *k.* Turn function switch (B) to FIELD INTENSITY.

Step *l.* Adjust signal generator to RI-FI Meter frequency. Carefully adjust for maximum meter indication. Adjust signal generator output (unmodulated) for an output meter indication of 100 microvolts. Record signal generator output reading in microvolts. The correction factor will be

$$K = \frac{\text{signal generator reading (microvolts)}}{100}$$

Step *m.* A chart can now be made. The ordinate will be a linear scale marked off in frequencies (240 to 400 megacycles). There will be two abscissas. The one on left will be calibration readings in db. The one on right will be correction factor in units (1 to 10). Plot the data taken above, using left scale for data in Step 9 and using scale on right for factor determined in Step 12.

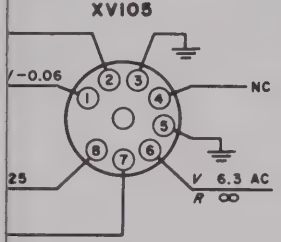
Step *n.* Repeat Steps *a* through *m* for each calibrating frequency.

Step *o.* Draw smooth curve through each set of points plotted above.

(3) Chart No. 3, an antenna adjustment table, Charts No. 4 and No. 5, antenna pickup device factors, and Chart No. 8, signal plus noise chart, are not influenced by realignment of the RI-FI Meter. No corrections need be made.

ATH I-F
D FROM

XV105



CONDITIONS OF MEASUREMENT

1. ALL MEASUREMENTS ARE MADE FROM POINT SHOWN TO CHASSIS.
2. ALL VOLTAGE MEASUREMENTS ARE MADE WITH BOTH 20,000 AND 1,000 OHM/VOLT METERS. THE 20,000 OHM/VOLT READING IS GIVEN FIRST, FOLLOWED BY THE 1,000 OHM/VOLT READING.
3. READINGS FOLLOWED BY "AC" WERE OBTAINED WITH A 1,000 OHM/VOLT A-C VOLTMETER.
4. ALL VOLTAGE AND RESISTANCE MEASUREMENTS WERE MADE WITH ALL FRONT PANEL POTENTIOMETERS FULLY COUNTERCLOCKWISE.
5. ALL MEASUREMENTS MADE WITH THE ATTENUATOR IN X1 POSITION AND FUNCTION SWITCH IN **FIELD INTENSITY** POSITION UNLESS OTHERWISE SPECIFIED.
6. ALL RESISTANCE MEASUREMENTS ARE MADE WITH THE POWER SUPPLY DISCONNECTED FROM THE RI-FI METER AND WITH ALL TUBES AND INDICATOR LIGHTS REMOVED.

NOTES:

* DEPENDS ON SETTINGS OF CHASSIS CONTROL. DO NOT CHANGE CONTROL SETTINGS EXCEPT IN ALIGNMENT AND CALIBRATION PROCEDURES.

** FUNCTION SWITCH IN **BFO** POSITION.

*** FUNCTION SWITCH IN **CAL** POSITION.

**** DEPENDS ON FREQUENCY DIAL SETTING.

***** FUNCTION SWITCH IN **QP** POSITION.

* 6.3 VOLTS AC MEASURED BETWEEN PINS 3 AND 4.
NO POTENTIAL BETWEEN EITHER PIN AND CHASSIS.
RESISTANCE TO CHASSIS FROM EITHER PIN IS INFINITY.

K = 1,000 OHMS
MEG = 1,000,000 OHMS
V INDICATES D-C VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
R INDICATES D-C RESISTANCE TO GROUND.
∞ = INFINITY
NC = NO CONNECTION

Figure 7-11. Radio Interference Measuring Set AN/URM-47A, Voltage and Resistance Data

Step 8. Repeat Steps 3 through 7 for each of the test frequencies in Bands 1 through 4.

Step 9. Using vertical scale of Charts No. 1 and No. 2, plot the values of calibrator pulse amplitude in db which were determined in Step 7. Draw a smooth curve through the plotted points.

Step 10. Repeat Steps 3 and 4 at the test frequency of 145 megacycles in Band 5. Then reduce signal generator output to zero. If M101 indication is less than one microvolt, use 100-microvolt signal generator output as suggested in Step 3. If M101 indication is greater than one microvolt, use a signal generator output of 200 microvolts in Step 3.

Step 11. Repeat Steps 3 through 7 for each of the test frequencies in Band 5, but using signal generator output indicated by Step 10. If 100 microvolts are used, the correction factor for Band 5 will be 1. If 200 microvolts are used, the correction factor for Band 5 will be 2.

Step 12. Using the vertical scale of Charts No. 1 and No. 2, plot the values of calibrator amplitude in db which were determined in Step 7. Draw a smooth curve through the plotted points.

Step 13. For test frequencies in Band 6, a different procedure will be used as the sensitivity will not reach the 1-microvolt level.

To achieve maximum sensitivity capabilities of this band, operate with a signal-to-noise ratio of unity. This means the noise level will be maintained at 1 microvolt.

Take data as follows:

Step *a.* Attenuator control (A) to CAL position.

Step *b.* Function switch (B) to CAL position.

Step *c.* Adjust CALIBRATE control (D) to extreme counterclockwise position.

Step *d.* Rotate PEAK control (C) for output meter indication of approximately full scale.

Step *e.* Turn PEAK SENS. control (E) clockwise until PEAK indicator lamp glows. Then counterclockwise until the lamp just ceases to glow.

Step *f.* Turn function switch (B) to FIELD INTENSITY position.

Step *g.* Adjust CALIBRATE control (D) for an indication of 1 microvolt on output meter.

Step *h.* Turn function switch (B) to CAL position.

Step *i.* Adjust PEAK control (C) counterclockwise until indicator lamp blinks at calibrator pulse frequency. Then turn clockwise until lamp just ceases to blink. Note M101 indication on db scale and record.

Step *j.* PULL-TURN-PUSH attenuator (A) to X1 position.

Step *k.* Turn function switch (B) to FIELD INTENSITY.

Step *l.* Adjust signal generator to RI-FI Meter frequency. Carefully adjust for maximum meter indication. Adjust signal generator output (unmodulated) for an output meter indication of 100 microvolts. Record signal generator output reading in microvolts. The correction factor will be

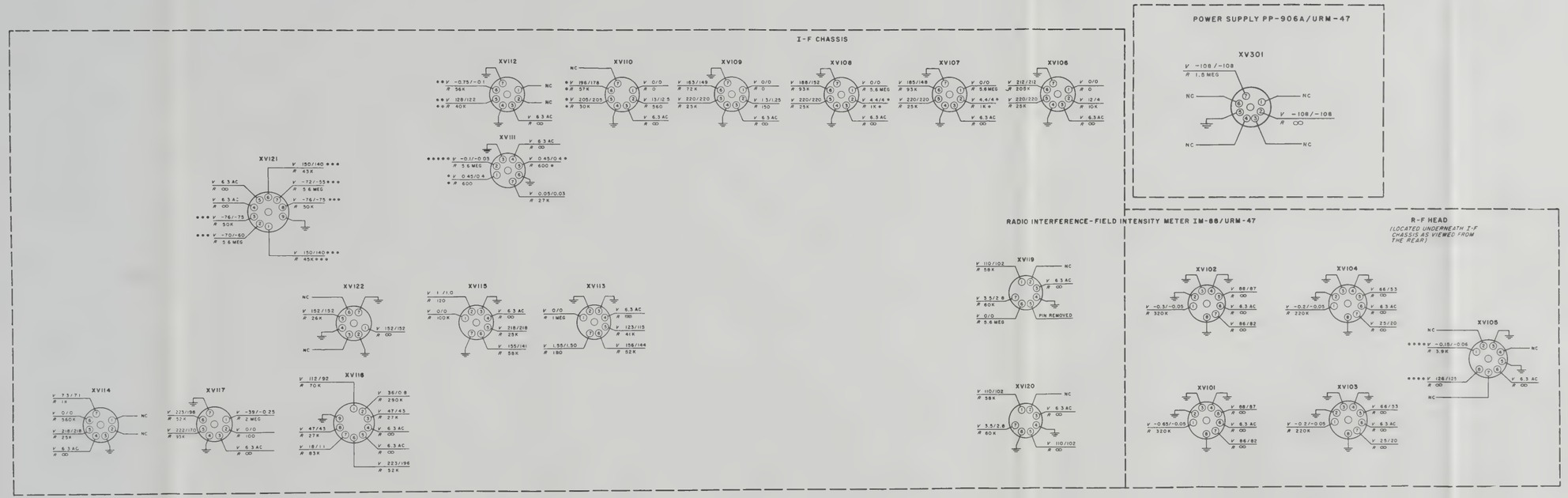
$$K = \frac{\text{signal generator reading (microvolts)}}{100}$$

Step *m.* A chart can now be made. The ordinate will be a linear scale marked off in frequencies (240 to 400 megacycles). There will be two abscissas. The one on left will be calibration readings in db. The one on right will be correction factor in units (1 to 10). Plot the data taken above, using left scale for data in Step 9 and using scale on right for factor determined in Step 12.

Step *n.* Repeat Steps *a* through *m* for each calibrating frequency.

Step *o.* Draw smooth curve through each set of points plotted above.

(3) Chart No. 3, an antenna adjustment table, Charts No. 4 and No. 5, antenna pickup device factors, and Chart No. 8, signal plus noise chart, are not influenced by realignment of the RI-FI Meter. No corrections need be made.



CONDITIONS OF MEASUREMENT

1. ALL MEASUREMENTS ARE MADE FROM POINT SHOWN TO CHASSIS.
2. ALL VOLTAGE MEASUREMENTS ARE MADE WITH BOTH 20,000 AND 1,000 OHM/VOLT METERS. THE 20,000 OHM/VOLT READING IS GIVEN FIRST, FOLLOWED BY THE 1,000 OHM/VOLT READING.
3. READINGS FOLLOWED BY "AC" WERE OBTAINED WITH A 1,000 OHM/VOLT A-C VOLTMETER.
4. ALL VOLTAGE AND RESISTANCE MEASUREMENTS WERE MADE WITH ALL FRONT PANEL POTENTIOMETERS FULLY COUNTERCLOCKWISE.
5. ALL MEASUREMENTS MADE WITH THE ATTENUATOR IN 81 POSITION AND FUNCTION SWITCH IN **FIELD INTENSITY** POSITION UNLESS OTHERWISE SPECIFIED.
6. ALL RESISTANCE MEASUREMENTS ARE MADE WITH THE POWER SUPPLY DISCONNECTED FROM THE R-F-I-F METER AND WITH ALL TUBES AND INDICATOR LIGHTS REMOVED.

NOTES:

- * DEPENDS ON SETTINGS OF CHASSIS CONTROL. DO NOT CHANGE CONTROL SETTINGS EXCEPT IN ALIGNMENT AND CALIBRATION PROCEDURES.
- ** FUNCTION SWITCH IN **BFO** POSITION.
- *** FUNCTION SWITCH IN **CAL** POSITION.
- **** DEPENDS ON FREQUENCY DIAL SETTING.
- ***** FUNCTION SWITCH IN **OP** POSITION.
- ⏚ 6.3 VOLTS AC MEASURED BETWEEN PINS 3 AND 4. NO POTENTIAL BETWEEN EITHER PIN AND CHASSIS. RESISTANCE TO CHASSIS FROM EITHER PIN IS INFINITY.

K = 1,000 OHMS
MEG = 1,000,000 OHMS
V INDICATES D-C VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
Ω INDICATES D-C RESISTANCE TO GROUND
∞ = INFINITY
NC = NO CONNECTION

Figure 7-11. Radio Interference Measuring Set AN/URM-47A, Voltage and Resistance Data

WIRE RUNNING LIST

WIRE NO.	FROM	TO
1	METER (+) M101	C278
2	METER (−) M101	P104 (10)
3	I102	TIE POINT
4	I102	P104 (14)
5	GROUND POST	P104 (1)
6	CENTER R191	P104 (16)
7	GROUND POST	P104 (3)
8	P109 (A)	J106 (A)
9	P109 (B)	P104 (25)
10	P109 (C)	TIE POINT
11	P109 (D)	GROUND POST
12	S103	P104 (13)
13	S103	TIE POINT
14	J107	P104 (18)
15	GROUND POST	P104 (5)
16	TIE POINT	J106 (B)
17	TIE POINT	J106 (B)
18	TIE POINT	P104 (9)
19	CENTER R128	P104 (8)
20	NOT USED	
21	GROUND POST	J106 (D)
22	C228	R216
23	NOT USED	
24	J106 (E)	P104 (15)
25	R215	P104 (12)
26	GROUND POST	RIGHT R231
27	CENTER R231	P104 (11)
28	TIE POINT	J106 (C)
29	J106 (C)	P104 (24)
30	J106 (A)	P104 (7)
31	TIE POINT	P104 (21)
32	J108 GROUND	P104 (20)

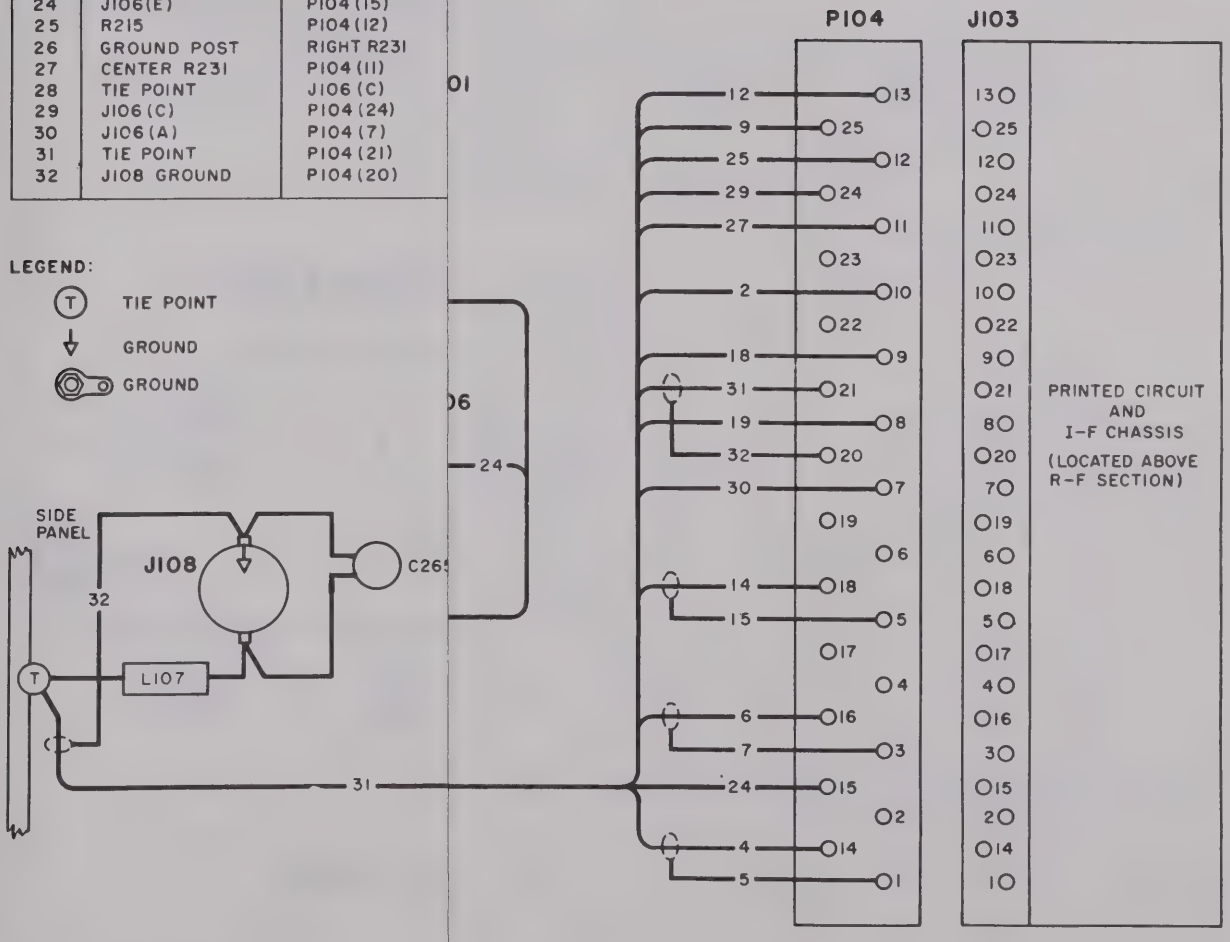


Figure 7-12. Radio Interference-Field Intensity Meter IM-88/URM-47, Wiring Diagram

WIRE RUNNING LIST

WIRE NO.	FROM	TO	COLOR
1	METER (+) M101	C278	RED
2	METER (−) M101	P104 (10)	BLACK
3	I102	TIE POINT	RED
4	I102	P104 (14)	SHIELDED WIRE
5	GROUND POST	P104 (1)	WIRE BRAID
6	CENTER R191	P104 (16)	SHIELDED WIRE
7	GROUND POST	P104 (3)	WIRE BRAID
8	P109 (A)	J106 (A)	BROWN
9	P109 (B)	P104 (25)	RED
10	P109 (C)	TIE POINT	WHITE
11	P109 (D)	GROUND POST	BLACK
12	S103	P104 (13)	WHITE
13	S103	TIE POINT	RED
14	J107	P104 (18)	SHIELDED WIRE
15	GROUND POST	P104 (5)	WIRE BRAID
16	TIE POINT	J106 (B)	RED
17	TIE POINT	J106 (B)	RED
18	TIE POINT	P104 (9)	RED
19	CENTER R128	P104 (8)	YELLOW
20	NOT USED		
21	GROUND POST	J106 (D)	BLACK
22	C228	R216	RED
23	NOT USED		
24	J106 (E)	P104 (15)	BLACK
25	R215	P104 (12)	RED
26	GROUND POST	RIGHT R231	BLACK
27	CENTER R231	P104 (11)	BLUE
28	TIE POINT	J106 (C)	WHITE
29	J106 (C)	P104 (24)	WHITE
30	J106 (A)	P104 (7)	BROWN
31	TIE POINT	P104 (21)	SHIELDED WIRE
32	J108 GROUND	P104 (20)	WIRE BRAID

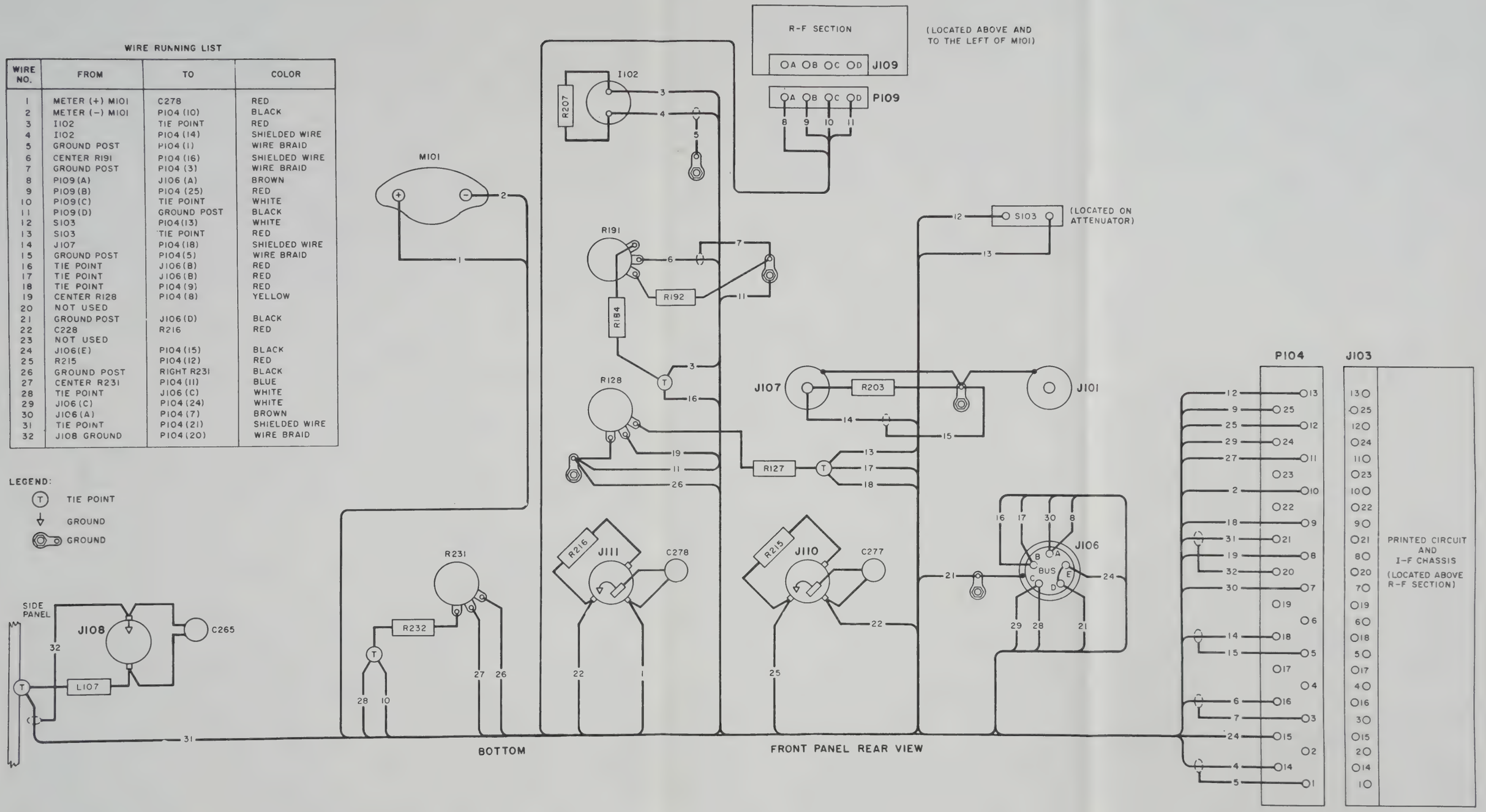


Figure 7-12. Radio Interference-Field Intensity Meter IM-88/URM-47, Wiring Diagram

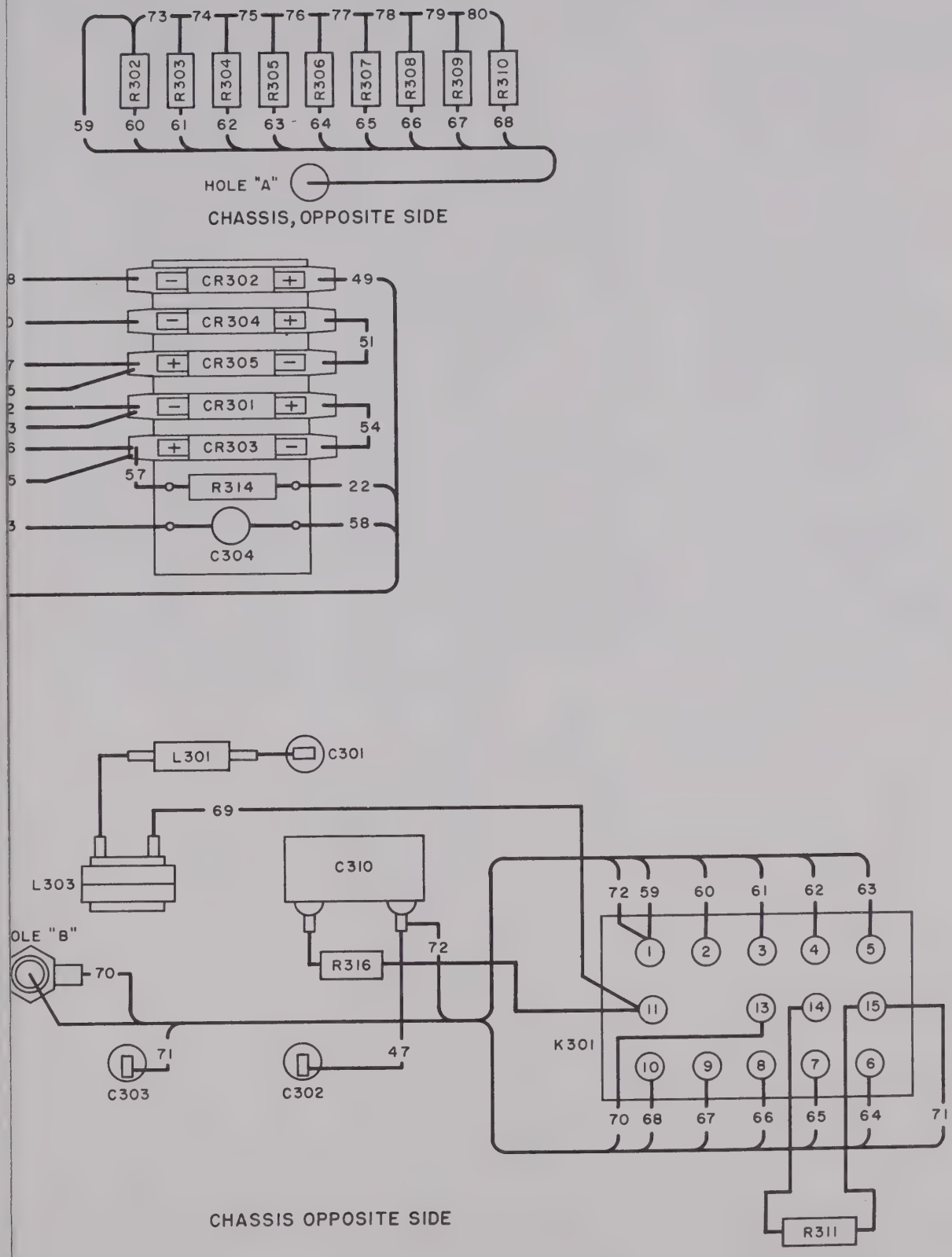


Figure 7-13. Power Supply PP-906A/URM-47, Wiring Diagram

WIRE NO.	FROM	TO	COLOR
1	J302 (A)	F301	GRAY
2	J302 (B)	GRD NO. 4	NO. 20 BUS
3	J302 (C)	F302	GRAY
4	F302	S301	
5	F301	S301	
6	S301	Z301	
7	S301	Z301	
8	Z301	T302 (1)	GRAY (2 BRN ENDS)
9	Z301	T302 (4)	GRAY (2 YLW ENDS)
10	J303	T302 (3)	GRAY
11	J303	Z301	GRAY (1 YLW END)
12	I301	T301 (7)	BROWN
13	I301	T301 (8)	
14	J301 (A)	T301 (7)	
15	J301 (B)	C306 (⊕)	RED
16	J301 (C)	V301 (2)	WHITE
17	J301 (D)	GRD NO. 5	BLACK
18	GRD NO. 5	GRD NO. 1	
19	J301 (E)	T301 (1)	
20	T301 (2)	GRD NO. 1	NO. 20 BUS
21	C303	R313 (S)	RED
22	S303	R314	
23	S303	C305 (+)	
24	C305 (⊕)	Z302 (3)	RED (2 OR ENDS)
25	C306 (+)	Z302 (4)	RED
26	Z302 (3)	Z302 (2)	NO. 20 BUS
27	Z302 (1)	CR305 (+)	RED (2 BRN ENDS)

WIRE NO.	FROM	TO	COLOR
28	Z302 (5)	V301 (7)	WHITE
29	V301 (1)	C307 (+)	BLACK
30	C307 (+)	C306 (−)	
31	C306 (−)	C305 (−)	
32	C305 (−)	GRD NO. 2	
33	S302	T302 (1)	GRAY (1 BRN END)
34	S302	T302 (2)	GRAY (2 RED ENDS)
35	S302	T302 (3)	GRAY (2 OR ENDS)
36	S302	T302 (4)	GRAY (2 YLW ENDS)
37	S302	S302	NO. 20 BUS
38	C311	C301	GRAY
39	C311	C302	
40	R301	C301	
41	R301	C302	
42	C309	T301 (5)	
43	C309	T301 (6)	
44	C302	T301 (6)	
45	T302 (6)	T301 (5)	
46	T302 (5)	C301	
47	C310	C302	BROWN
48	CR302 (−)	C307 (−)	WHITE
49	CR302 (−)	T301 (3)	GRAY
50	CR304 (+)	T301 (4)	GRAY (2 YLW ENDS)
51	CR304 (+)	CR305 (−)	NO. 20 BUS
52	CR301 (−)	T301 (1)	GRAY (2 BRN ENDS)
53	CR301 (−)	C304	NO. 20 BUS
54	CR301 (+)	CR303 (−)	

WIRE NO.	FROM	TO	COLOR
55	CR303 (+)	CR305 (+)	NO. 20 BUS
56	CR303 (+)	R313 (H)	RED
57	R314	CR303 (+)	NO. 20 BUS
58	C304	R313 (S)	RED
59	K301 (1)	R302	BROWN
60	K301 (2)	R302	RED
61	K301 (3)	R303	ORANGE
62	K301 (4)	R304	YELLOW
63	K301 (5)	R305	GREEN
64	K301 (6)	R306	BLUE
65	K301 (7)	R307	VIOLET
66	K301 (8)	R308	GRAY
67	K301 (9)	R309	WHITE
68	K301 (10)	R310	BLACK
69	K301 (11)	L303	WHITE
70	K301 (13)	GRD NO. 3	BLACK
71	K301 (15)	C303	RED
72	K301 (1)	C310	BROWN
73	R302	R303	NO. 20 BUS
74	R303	R304	
75	R304	R305	
76	R305	R306	
77	R306	R307	
78	R307	R308	
79	R308	R309	
80	R309	R310	

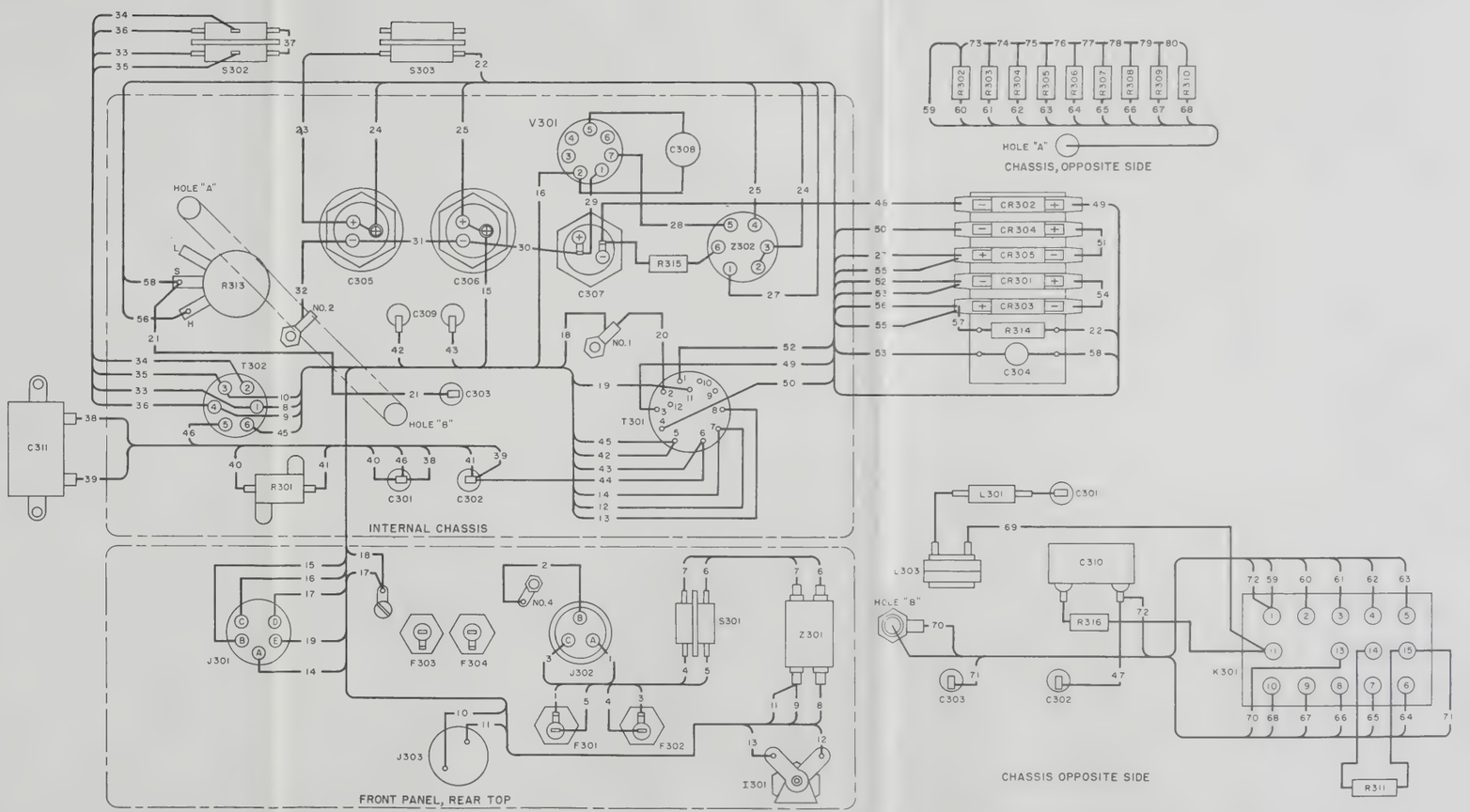


Figure 7-13. Power Supply PP-906A/URM-47, Wiring Diagram

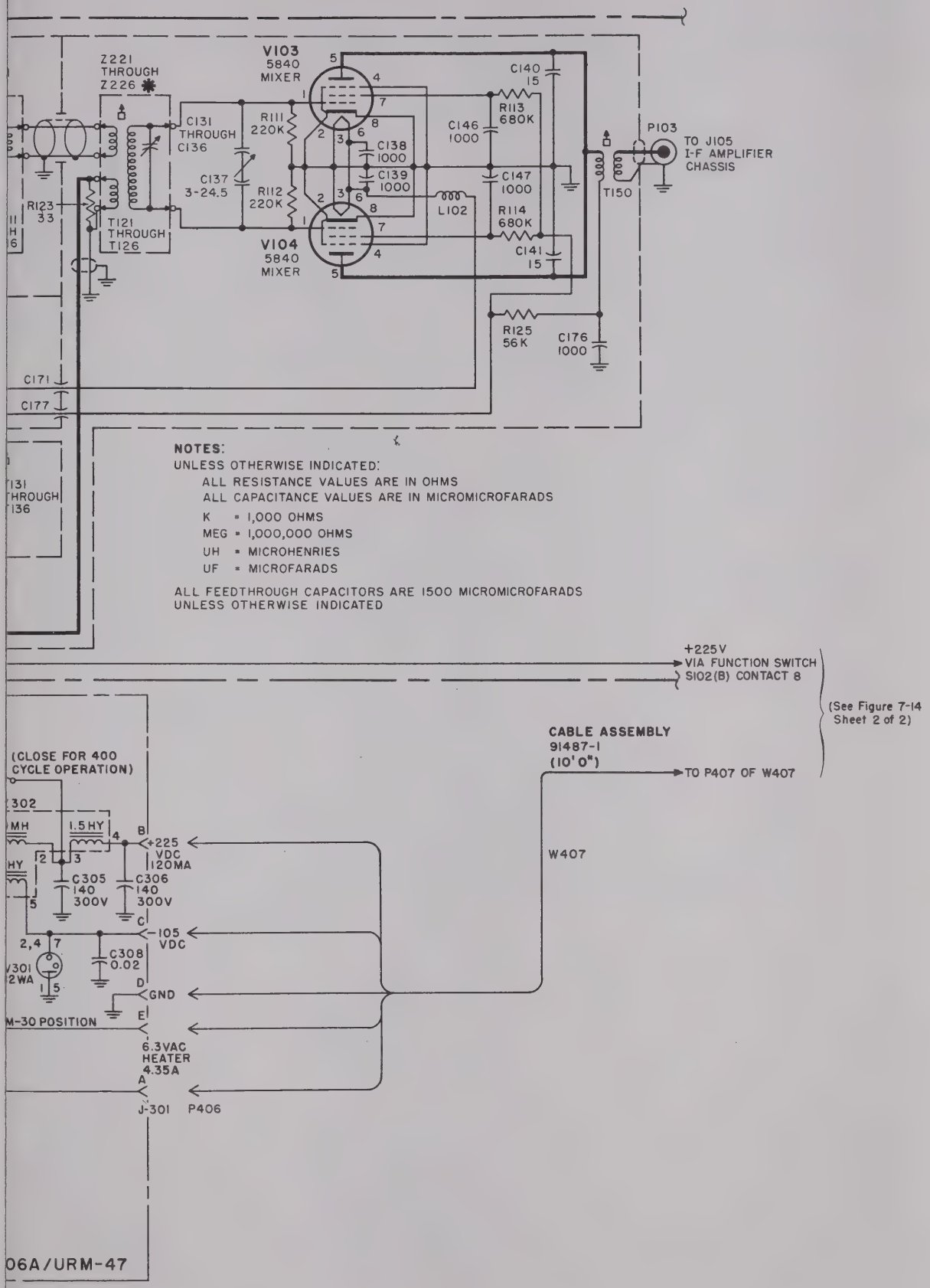


Figure 7-14. Radio Interference Measuring Set AN/URM-47A, Complete Schematic Diagram (Sheet 1 of 2 Sheets)

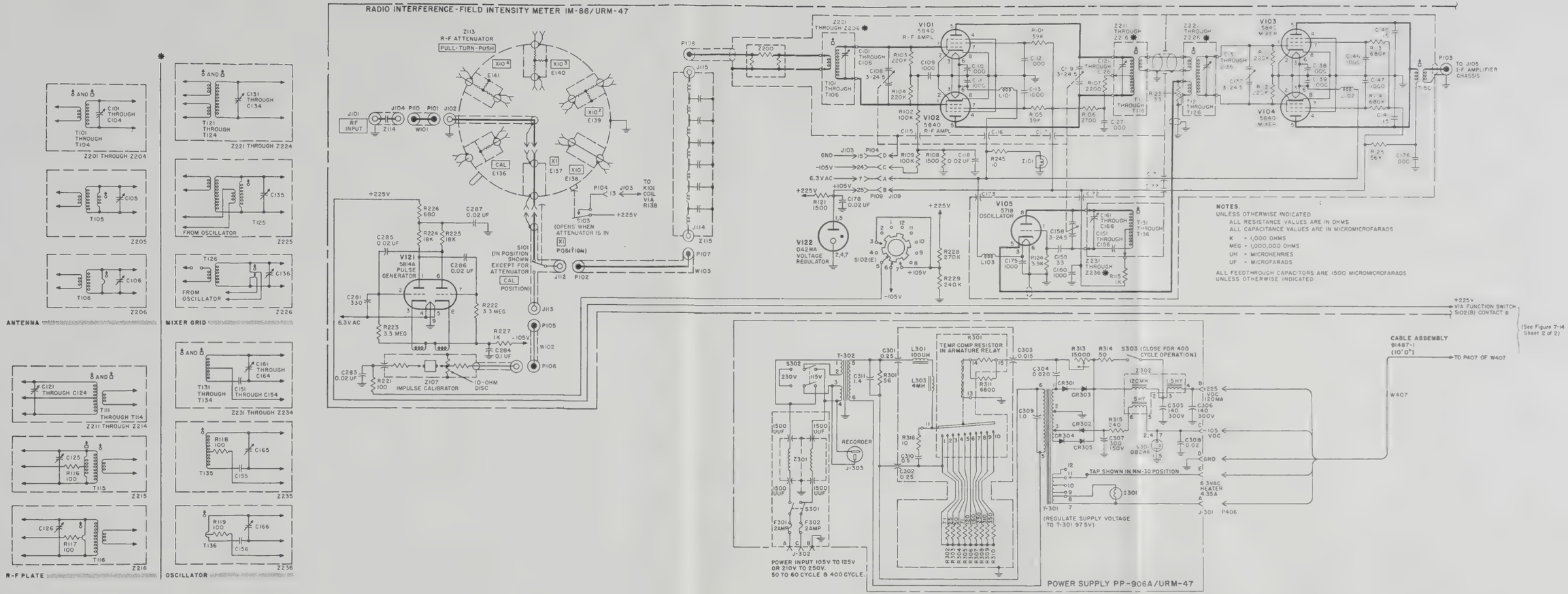


Figure 7-14. Radio Interference Measuring Set AN/URM-47A, Complete Schematic Diagram (Sheet 1 of 2 Sheets)

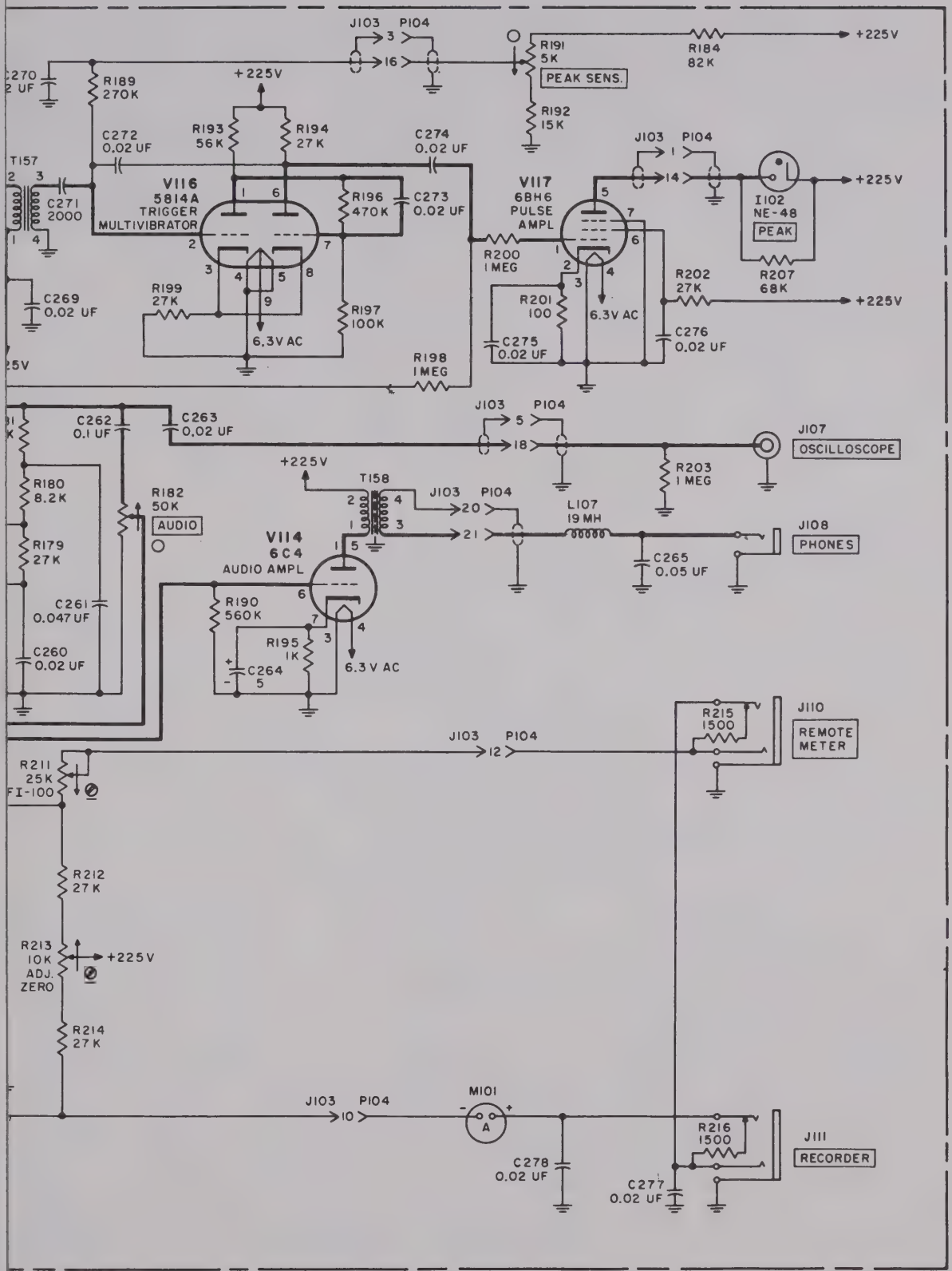


Figure 7-14. Radio Interference Measuring Set AN/URM-47A, Complete Schematic Diagram (Sheet 2 of 2 Sheets)

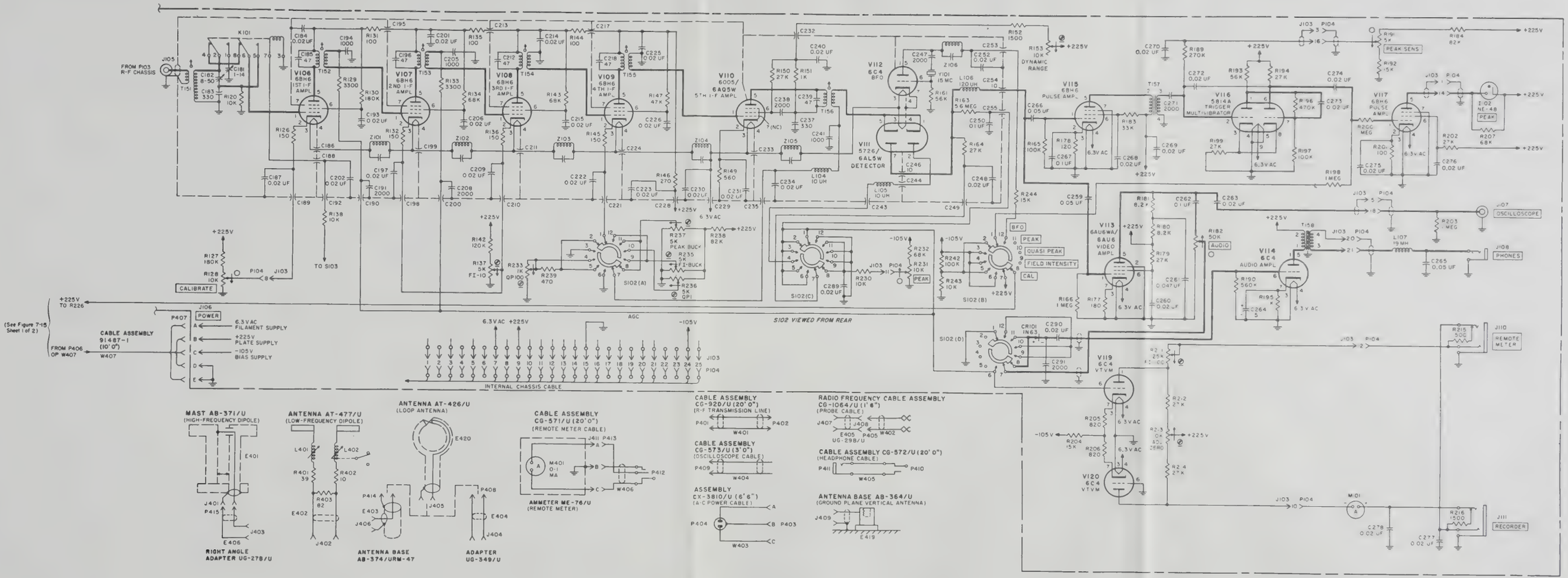
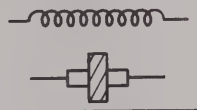
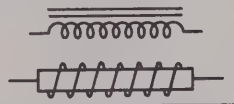
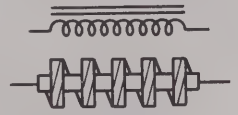
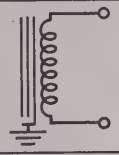
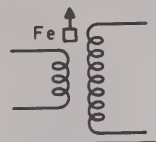
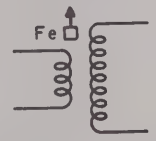


Figure 7-14. Radio Interference Measuring Set AN/URM-47A, Complete Schematic Diagram (Sheet 2 of 2 Sheets)

TABLE 7-4. WINDING DATA

SYMBOL DESIGNATION	STODDART PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE (OHMS)	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
L101 L102 L103	10617		ONE WINDING (AIR FORM)	NO. 24	21	LOW	——	—	SOLENOID WOUND $\frac{3}{32}$ ID X $\frac{1}{2}$ LONG
L104 L105	10360		SINGLE PIE UNIVERSAL WOUND	NO. 39 SNE	51	2.25	——	—	10 UH UNIVERSAL
L106	10692		ONE WINDING	NO. 38	110	3	——	—	SOLENOID WOUND
L107	90825-1		5 PIES UNIVERSAL WOUND	NO. 39 SNE	220 PER PIE	90	——	—	19.2 MH
L301	90292		SINGLE	NO. 24	10	LOW	——	—	*
L303	11188		ONE WINDING	NO. 22	80	0.32	——	500	
L401 L402	10249		VARIABLE WIRE WOUND TOROIDAL	—	—	LOW	——	—	3.6 UH*
T101	90841-1		PRIMARY SECONDARY	NO. 32 NO. 32	2 26	LOW LOW	—— ——	— —	SOLENOID WOUND SOLENOID WOUND
T102	90842-1		PRIMARY SECONDARY	NO. 30 NO. 24	2 18	LOW LOW	—— ——	— —	SOLENOID WOUND SOLENOID WOUND

*DO NOT REPAIR. REPLACE ASSEMBLY WHEN NECESSARY

TABLE 7-4. WINDING DATA (Cont'd)

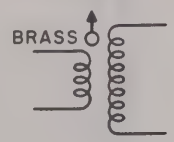
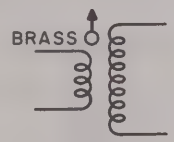
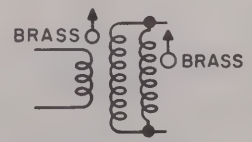
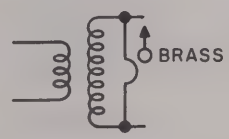
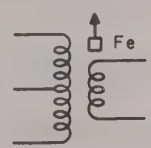
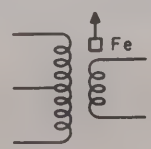
SYMBOL DESIGNATION	STODDART PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE (OHMS)	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T103	90843-1		PRIMARY	NO. 30	1	LOW	———	———	SOLENOID WOUND
			SECONDARY	NO. 24	10	LOW	———	———	SOLENOID WOUND
T104	90844-1		PRIMARY	NO. 30	1	LOW	———	———	SOLENOID WOUND
			SECONDARY	NO. 24	5	LOW	———	———	SOLENOID WOUND
T105	90845-1		PRIMARY	NO. 30	1	LOW	———	———	SOLENOID WOUND
			SHUNT SECONDARY	NO. 24	11	LOW	———	———	SOLENOID WOUND
			SECONDARY	NO. 24	3	LOW	———	———	SOLENOID WOUND
T106	90846-1		PRIMARY	NO. 30	2	LOW	———	———	SOLENOID WOUND
			SHUNT SECONDARY	NO. 24	8	LOW	———	———	SOLENOID WOUND
			SECONDARY	COPPER STRAP	1	LOW	———	———	———
T111	90851-1		PRIMARY	NO. 32	25	LOW	———	———	SOLENOID WOUND CENTER TAP
			SECONDARY	NO. 32	1	LOW	———	———	SOLENOID WOUND
T112	90852-1		PRIMARY	NO. 24	18	LOW	———	———	SOLENOID WOUND CENTER TAP
			SECONDARY	NO. 30	1	LOW	———	———	SOLENOID WOUND

TABLE 7-4. WINDING DATA (Cont'd)

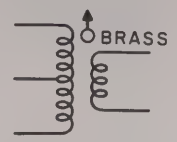
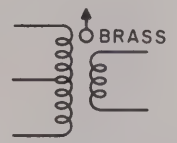
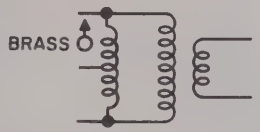
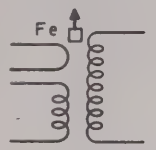
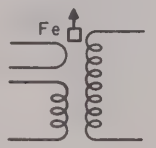
SYMBOL DESIGNATION	STODDART PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE (OHMS)	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T113	90853-1		PRIMARY	NO. 24	10	LOW	——	——	SOLENOID WOUND CENTER TAP
			SECONDARY	NO. 30	1	LOW	——	——	SOLENOID WOUND
T114	90854-1		PRIMARY	NO. 24	5	LOW	——	——	SOLENOID WOUND CENTER TAP
			SECONDARY	NO. 30	1	LOW	——	——	SOLENOID WOUND
T115	90855-1		PRIMARY	NO. 30	3	LOW	——	——	SOLENOID WOUND CENTER TAP
			SHUNT SECONDARY	NO. 24	11	LOW	——	——	SOLENOID WOUND
			SECONDARY	NO. 24	1	LOW	——	——	SOLENOID WOUND
T116	90856-1		PRIMARY	COPPER STRAP	1	LOW	——	——	COPPER STRAP CENTER TAP
			SHUNT PRIMARY	NO. 24	9	LOW	——	——	SOLENOID WOUND
			SECONDARY	NO. 30	1	LOW	——	——	SOLENOID WOUND
T121	90861-1		PRIMARY	NO. 32	2	LOW	——	——	SOLENOID WOUND
			SECONDARY	NO. 32	25	LOW	——	——	SOLENOID WOUND
			TERTIARY	NO. 32	1	LOW	——	——	SOLENOID WOUND
T122	90862-1		PRIMARY	NO. 30	1	LOW	——	——	SOLENOID WOUND
			SECONDARY	NO. 24	18	LOW	——	——	SOLENOID WOUND
			TERTIARY	NO. 30	2	LOW	——	——	SOLENOID WOUND

TABLE 7-4. WINDING DATA (Cont'd)

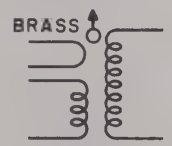
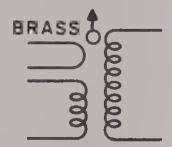
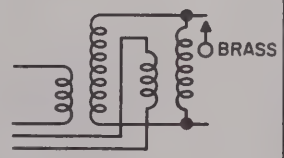
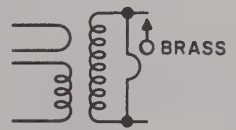
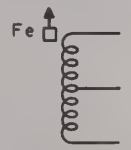
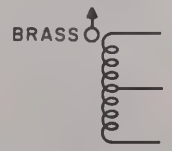
SYMBOL DESIGNATION	STODDART PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE (OHMS)	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T123	90863-1		PRIMARY	NO. 30	1	LOW	——	——	SOLENOID WOUND
			SECONDARY	NO. 24	10	LOW	——	——	SOLENOID WOUND
			TERTIARY	NO. 30	1	LOW	——	——	SOLENOID WOUND
T124	90864-1		PRIMARY	NO. 30	1	LOW	——	——	SOLENOID WOUND
			SECONDARY	NO. 24	5	LOW	——	——	SOLENOID WOUND
			TERTIARY	NO. 30	2	LOW	——	——	SOLENOID WOUND
T125	90865-1		PRIMARY	NO. 30	2	LOW	——	——	SOLENOID WOUND
			SECONDARY	NO. 24	2	LOW	——	——	SOLENOID WOUND
			SHUNT SECONDARY	NO. 24	11	LOW	——	——	SOLENOID WOUND
			TERTIARY	NO. 30	4	LOW	——	——	SOLENOID WOUND
T126	90866-1		PRIMARY	NO. 30	2	LOW	——	——	SOLENOID WOUND
			SHUNT SECONDARY	NO. 24	9	LOW	——	——	SOLENOID WOUND
			SECONDARY	COPPER STRAP	1	LOW	——	——	——
			TERTIARY	NO. 30	2	LOW	——	——	SOLENOID WOUND
T131	90871-1		ONE WINDING	NO. 32	12	LOW	——	——	UNIVERSAL WOUND CENTER TAP
T132	90872-1		SECONDARY	NO. 24	15	LOW	——	——	SOLENOID WOUND CENTER TAP

TABLE 7-4. WINDING DATA (Cont'd)

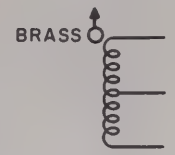
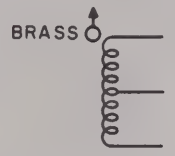
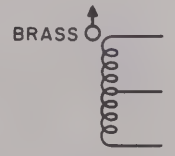
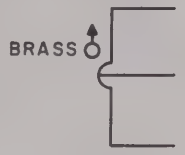
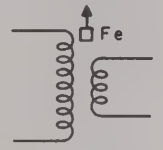
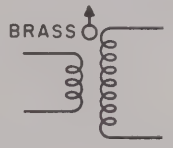
SYMBOL DESIGNATION	STODDART PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE (OHMS)	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T133	90873-1		ONE WINDING	NO. 24	8	LOW	——	——	SOLENOID WOUND CENTER TAP
T134	90874-1		ONE WINDING	NO. 24	4	LOW	——	——	SOLENOID WOUND CENTER TAP
T135	90875-1		ONE WINDING	NO. 24	3	LOW	——	——	SOLENOID WOUND CENTER TAP
T136	90876-1		ONE WINDING	1/8 STRAP	U-SHAPE	LOW	——	——	U-SHAPE STRAP CENTER TAP
T150	90837-1		PRIMARY SECONDARY	NO. 30 NO. 30	31 2	LOW LOW	—— ——	—— ——	SOLENOID WOUND SOLENOID WOUND
T151	90840-1		PRIMARY SECONDARY	NO. 31 NO. 31	3 16	LOW LOW	—— ——	—— ——	SOLENOID WOUND SOLENOID WOUND

TABLE 7-4. WINDING DATA (Cont'd)

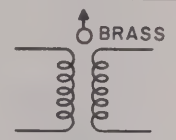
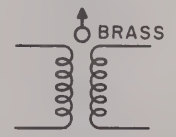
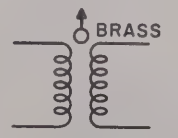
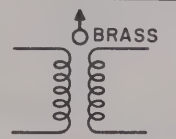
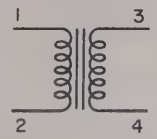
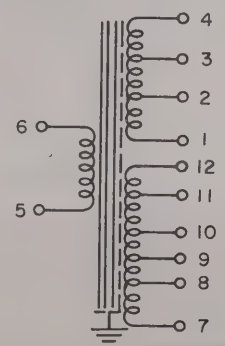
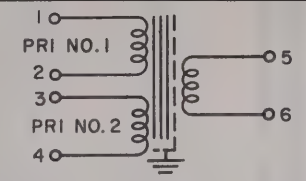
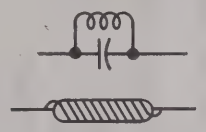
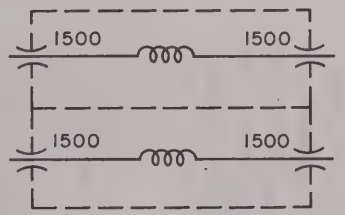
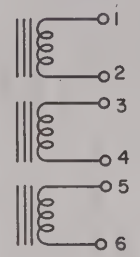
SYMBOL DESIGNATION	STODDART PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE (OHMS)	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T152 T153	90850-1 90850-1		PRIMARY SECONDARY	NO. 31 NO. 31	14 14	LOW LOW	—— ——	— —	SOLENOID WOUND SOLENOID WOUND
T154	90948-1		PRIMARY SECONDARY	NO. 31 NO. 31	15 15	LOW LOW	—— ——	— —	SOLENOID WOUND SOLENOID WOUND
T155	90982-1		PRIMARY SECONDARY	NO. 31 NO. 31	14 14	LOW LOW	— —	— —	SOLENOID WOUND SOLENOID WOUND
T156	90860-1		PRIMARY SECONDARY	NO. 31 NO. 31	14 12	LOW LOW	—— ——	— —	SOLENOID WOUND SOLENOID WOUND
T157 T158	10128		PRIMARY 1-2 SECONDARY 3-4	41E 36E	3600 960	860 95	1 TO 0.06	1000V 1000V	IMPEDANCE 10K IMPEDANCE 600 OHMS
T301	11186		PRIMARY 5-6 SECONDARY 1-4 SECONDARY 7-12	NO. 23 NO. 31 NO. 18 (DOUBLE)	294 1380 26	3.64 100 0.057	—— —— ——	1500 2000 1500	

TABLE 7-4. WINDING DATA (Cont'd)

SYMBOL DESIGNATION	STODDART PART NO.	DIAGRAM	WINDING	WIRE SIZE	TURNS	D-C RESISTANCE (OHMS)	IMPEDANCE RATIO	HIPOT A-C VOLTS	REMARKS
T302	11172		PRIMARY 1-2 PRIMARY 3-4 SECONDARY	NO. 25 NO. 25 NO. 23	290 290 312	5.7 64 4.9	— — —	1000 1000 1000	
T303 TO T399		NOT USED							
Z101 THROUGH Z106	90839-1		SINGLE	NO. 25	15	LOW	—	—	SOLENOID WOUND ON CAPACITOR 200 UUF RESONATES AT 15 MC
Z115	91033-1	COAXIAL LINE, LOW PASS FILTER-NO WINDINGS	—	—	—	—	—	—	—
Z301	90386		SINGLE	NO. 24	10	LOW	—	—	*
Z302	11187		CHOKE SINGLE 1-2 SINGLE 3-4 SINGLE 5-6	NO. 29 NO. 29 NO. 37	700 1500 4500	11.5 430 470	— — —	— — —	
Z303 TO Z399		NOT USED							

* DO NOT REPAIR. REPLACE ASSEMBLY WHEN NECESSARY

SECTION 8

PARTS LIST

8-1. INTRODUCTION.

Reference designations have been assigned to identify all maintenance parts of the equipment. They are used for marking the equipment (adjacent to the part they identify) and are included in drawings, diagrams, and the parts list. The letter of the reference designation indicates the kind of part (generic group), such as resistor, electron tube, etc. The number portion of the reference designation differentiates between parts of the same generic group.

Radio Interference Measuring Set AN/URM-47A includes two major units, the Receiver and Power Supply. In addition to the major units, Radio Interference Measuring Set AN/URM-47A includes such accessory equipment as a Tripod, Antenna, Remote Meter, Carrying Cases, and Cables.

Each major unit has been assigned a block of series numbers. The Receiver has been assigned the block of series numbers 100-299, the Power Supply the block of series numbers 300-399, and the accessories the block of series numbers 400-499.

A socket associated with a particular plug-in device, such as an electron tube or a fuse, is identified by a reference designation that includes a number portion of the reference designation of the plug-in device. For example, the socket for electron tube V104 is designated XV104.

8-2. MAINTENANCE PARTS LIST.

Table 8-1 lists both major units and their maintenance parts.

Column 1 lists the reference designation of the various parts in alphabetical and numerical order.

Column 2 refers to the explanatory notes that appear in paragraph 7 of this section.

Column 3 gives the name and description of the various parts. Complete information is given for all key parts (parts differing from any parts previously listed in the table). The name and description are omitted for similar parts previously described within both major units, however, reference is made to the key part for the data.

Column 4 indicates the function of the part and gives its functional location in the equipment.

8-3. STOCK NUMBER IDENTIFICATION AND LOCATION OF PARTS SUPPLIED.

Table 8-2 is arranged by reference designation. The STOCK NUMBER column gives stock numbers for key parts in either Federal or Signal Corps. Therefore, to use this table properly, obtain the reference designation for the part to be replaced. Then find its corresponding key reference designation from table 8-1 before using table 8-2.

The location of the maintenance parts can be obtained from the packing list in the maintenance parts boxes.

8-4. STOCK NUMBER CROSS REFERENCE.

Table 8-3 lists by stock numbers all key parts that have been assigned stock numbers. If the stock number of a part used in this equipment is known, this table provides the corresponding reference designation.

8-5. LIST OF MANUFACTURERS.

Table 8-4 lists manufacturers of parts used in the equipment. The prefix letters or abbreviations are assigned by the Bureau of Ships. These prefix letters or abbreviations are used in descriptions of table 8-1.

8-6. COLOR CODE.

Table 8-5 lists the standard color codes used on resistors and capacitors.

8-7. NOTES.

The following notes provide additional information concerning items listed in table 8-1.

NOTES	DEFINITIONS
P	Applied to parts which are procured in view of relatively high usage and which are relatively simple to manufacture within the Naval Establishment, if necessary. Code "P" indicates that the part is available in the supply system.
P1	Applied to parts which are procured in view of relatively high usage but which are very difficult, impractical, or uneconomical to manufacture. Code "P1" indicates that the part is available in the supply system.

NOTES	DEFINITIONS
P2	Applied to parts for which little usage is anticipated but which are procured in limited quantity for insurance purposes. Parts coded "P2" are difficult to manufacture, require special tooling not normally available within the Naval Establishment, or require long production lead time.
P3	Applied to parts which are procured in quantity in accordance with the life expectancy of the part. Parts coded "P3" are deteriorative in nature and may require special storage conditions.
X	Applied to main structural members or similar parts which, if required, would suggest extensive repair. The need for a part, or parts, coded "X" will normally result in a recommendation for complete overhaul or retirement of the equipment from service.
X1	Applied to parts for which procurement of the next larger assembly source coded "P" is justified; e.g., an internal detail part, such as welded segment inseparable from its assembly, a part which must be machined and installed with other parts in a matched set, or a part of an assembly, which, if required, would suggest extensive reconditioning of each assembly.
X2	Applied to parts which are not procured for stock but may be acquired for use through salvage. Activities requiring such parts will attempt to obtain from salvage; if not obtainable from salvage, such parts will be requisitioned through normal supply channels with supporting justification. Repeated requests may justify a change to a "P" source code.
A	Applied to assemblies which are not procured but which are to be assembled within the Naval Establishment prior to installation. At least one of the parts in the assembly must be a "P" series part which carries an individual part number and description.
F	Activity to which equipment is assigned (e.g., vessel, FASRON, or self-supported squadron).
M	Applied to parts which are capable of being manufactured within the Naval Establishment. Parts coded "M" have no anticipated or relatively low usage, or possess restrictive installation or storage factors.
T	Tender or repair ship.
C	Consumable (expendable) parts that are neither repairable nor salvageable (optional).
N	Applied to parts which do not meet established criteria for stocking and which are normally readily available from commercial sources. Parts coded "N" will be procured on demand in accordance with applicable procedures.
U	Applied to parts which are not of supply or maintenance significance, such as, installation drawings, diagrams, instruction sheets, field service drawing numbers, and parts which should not or cannot be procured or manufactured (optional).
O	Overhaul activities.
E	Specialized repair facilities.
B	Specific maintenance requirements not applicable (optional).
R	*Repairable*—Parts which are uneconomical and practical to repair. Replacements will be obtained and expended parts returned in accordance with instructions issued by the inventory manager.
S	*Salvageable*—Parts which are economical and practical to salvage and which may be placed in "Ready for Issue" condition by cleaning, replating, anodizing, adjusting, replacement of bearings or bushings. "S" coded parts may contain parts or materials which are usable, valuable, or critical, and which may be placed in the supply system for issue.

In assigning the above listed codes the following sequence will be followed: The first letter or letter plus digit gives consumer source information; the second and third letter gives respectively the lowest maintenance echelon capable of installing the part and the lowest maintenance echelon capable of manufacturing, assembling or testing a part prior to installation; the fourth letter gives the recoverability status.

TABLE 8-1. MAINTENANCE PARTS LIST

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A	
100-299		RADIO INTERFERENCE-FIELD INTENSITY METER: AN type IM-88/URM-47; covers frequency range of 20 to 400 mcs in six bands; ±2% frequency calibration accuracy; 50 ohms input impedance; microvolt db meter; operates from power supply PP-906A/URM-47; CADV No. 90784-1 (ND)	Radio interference-field intensity meter unit
C101		CAPACITOR, VARIABLE: approx 2 to 8 mmf; p/o Z201 (LISTED FOR REFERENCE ONLY)	Trimmer capacitor T101 secondary
C102		Same as C101 (p/o Z202)	Trimmer capacitor T102 secondary
C103		Same as C101 (p/o Z203)	Trimmer capacitor T103 secondary
C104		Same as C101 (p/o Z204)	Trimmer capacitor T104 secondary
C105		Same as C101 (p/o Z205)	Trimmer Capacitor T105 secondary
C106		CAPACITOR, VARIABLE: approx 1 to 6 mmf; p/o Z206 (LISTED FOR REFERENCE ONLY)	Trimmer capacitor T106 secondary
C107		Not used	
C108		CAPACITOR, VARIABLE: min effective capacity 3 mmf, max effective capacity approx 24.5 mmf; 800 vdcw; 2-13/32 in. lg (including shaft extension) by 1.547 in. h by 1.5 in. w; counterclockwise rotation; front and back supporting plates Steatite; RGN-80 phenolic bearing supports; front bearing consists of eleven 0.098 in. dia glass ball bearings; rear bearing five identical balls; front and back stators ea five plates; front and back rotors ea six plates; CHC No. 343 51-GI; CADV No. 10485 (ND)	Antenna coil tuning capacitor
C109		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 mmf; G.M.V. 500 vdcw; dipped phenolic insulation, wax impregnated; 3/16 in. by 3/16 in. by 0.080 in.; two wire leads 1/2 in. lg; CER No. 3801; CADV No. 10444 (ND)	R-f stage grid circuit decoupling
C110		Same as C109	Heater bypass V101
C111		Same as C109	Heater bypass V102
C112		Same as C109	Screen bypass V101

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
C113		Same as C109	Screen bypass V102
C114		Not used	
C115		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1500 mmf ±20%; 500 vdcw; feedthru type; ceramic insulation; 3-1/4 in. lg by 5/16 in. hex; axial soft wire leads; erie HI-K-12 temp coefficient; threaded 12-28 for mtg; CER No. 362; CADV No. 10364	Grid bias bypass r-f stage
C116		Same as C115	Heater circuit bypass r-f stage
C117		Same as C115	B+ bypass, r-f stage
C118		CAPACITOR, FIXED, CERAMIC DIELECTRIC: disc type; 20,000 mmf; 600 vdcw; tolerance G.M.V.; 9/16 in. dia; 0.156 in. thk; color, green; marked "CR" and "0.02"; 2 radial wire leads 1-3/4 in. lg; CBN No. DD-208; CADV No. 10493	Grid bias bypass r-f stage
C119		CAPACITOR, VARIABLE, AIR DIELECTRIC: min effective capacity approx 3 mmf; max effective capacity approx 24.5 mmf; 800 vdcw; length 3-13/32 in. by 1.547 in. h by 1.5 in. w; clockwise rotation; front and back supporting plates Steatite; No. RGN-30 phenolic bearing supports; front bearing consists of eleven 0.093 in. dia glass ball bearings; rear bearing five identical balls; front and back stators ea five plates; front and back rotors ea six plates; CHC No. 34352-GI; CADV No. 10486	Tuning capacitor amplifier plate circuit
C120		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 5000 mmf; G.M.V.; 500 vdcw; 3/8 in. square; 2 radial wire leads; Mucon type "HIGH-K" series; Mucon HK-2; CADV No. 10998 (ND)	B+ bypass, r-f stage
C121		Same as C101 (p/o Z211)	Trimmer capacitor T111 primary
C122		Same as C101 (p/o Z212)	Trimmer capacitor T112 primary
C123		Same as C101 (p/o Z213)	Trimmer capacitor T113 primary
C124		Same as C101 (p/o Z214)	Trimmer capacitor T114 primary
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
C125		Same as C101 (p/o Z215)	Trimmer capacitor T115 primary
C126		Same as C106 (p/o Z216)	Trimmer capacitor T116 primary
C127		Same as C109	B+ bypass, r-f amplifier
C128 thru C130		Not used	
C131		Same as C101 (p/o Z221)	Trimmer capacitor T121 secondary
C132		Same as C101 (p/o Z222)	Trimmer capacitor T122 secondary
C133		Same as C101 (p/o Z223)	Trimmer capacitor T123 secondary
C134		Same as C101 (p/o Z224)	Trimmer capacitor T124 secondary
C135		Same as C101 (p/o Z225)	Trimmer capacitor T125 secondary
C136		Same as C106 (p/o Z226)	Trimmer capacitor T126 secondary
C137		Same as C108	Tuning capacitor mixing stage
C138		Same as C109	Heater bypass V103
C139		Same as C109	Heater bypass V104
C140		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 15 mmf ±1 mmf temp coeffiecient; ±30 ppm/°C; not insulated; 500 vdcw; max dim. 0.400 in. lg by 0.200 in. dia; two radial wire leads, 2 in. lg; CER No. CC20AG150F; CADV No. 10664-150	R-f bypass V103
C141		Same as C140	R-f bypass V104

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
C142 thru C145		Not used	
C146		Same as C109	Screen bypass V103
C147		Same as C109	Screen bypass V104
C148 thru C150		Not used	
C151		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 47.7 mmf ±1%; 500 vdcw; porcelain enamel ceramic insulation; temp coefficient +120 ±5 ppm/°C; max dim. 0.40 in. lg by 0.25 in. w by 0.24 in. thk; axial wire leads 1-1/4 in. lg; Vitramon type 70; CADV No. 10671 (ND)	T131 padder
C152		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 74.4 mmf ±1%; 500 vdcw; porcelain enamel ceramic insulation; temp coefficient +120 ±5 ppm/°C; max dim. 0.40 in. lg by 0.25 in. w by 0.24 in. thk; axial wire leads 1-1/4 in. lg; Vitramon type 70; CADV No. 10672 (ND)	T132 padder
C153		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 120.8 mmf ±1%; 500 vdcw; porcelain enamel ceramic insulation; temp coefficient +120 ±5 ppm/°C; max dim. 0.40 in. lg by 0.25 in. w by 0.24 in. thk; axial wire leads 1-1/4 in. lg; Vitramon type 70; CADV No. 10673 (ND)	T133 padder
C154		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 197.7 mmf ±1%; 500 vdcw; porcelain enameled ceramic insulation; temp coefficient +120 ±5 ppm/°C; max dim. 0.40 in. lg by 0.25 in. w by 0.24 in. thk; axial wire leads 1-1/4 in. lg; Vitramon 70; CADV No. 10674 (ND)	T134 padder
C155		CAPACITOR, FIXED, MICA DIELECTRIC: 323 mmf ±2%; 500 vdcw; max operating temp 150°C; wax impregnated; overall dim. 0.507 in. by 0.447 in. dia (includes solder lugs by which capacitor is mounted); CER No. 370CA; CADV No. 10734 (ND)	T135 padder
C156		CAPACITOR, FIXED, MICA DIELECTRIC: 750 mmf ±5%; 500 vdcw; max operating temp 150°C; wax impregnated; overall dim. 0.4606 in. by 0.447 in. dia (includes solder lugs by which capacitor is mounted); CER No. 370CC; CADV No. 10779 (ND)	T136 padder
C157		Not used	
C158		Same as C119	Oscillator tuning capacitor

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
C159		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 33 mmf ±5%; temp coefficient −220 ±60 ppm/°C; tubular; not insulated; 500 vdcw; max dim. 0.400 in. lg by 0.200 in. dia; two radial wire leads, 2 in. lg; CER No. CC20RH330J; CADV No. 10735 (ND)	V105 coupling capacitor
C160		Same as C109	B+ bypass V105
C161		Same as C101 (p/o Z231)	Trimmer capacitor T131 primary
C162		Same as C101 (p/o Z232)	Trimmer capacitor T132 primary
C163		Same as C101 (p/o Z233)	Trimmer capacitor T133 primary
C164		Same as C101 (p/o Z234)	Trimmer capacitor T134 primary
C165		Same as C101 (p/o Z235)	Trimmer capacitor T135 primary
C166		CAPACITOR, VARIABLE: ceramic dielectric; 1.5 to 10 mmf; p/o Z236 (LISTED FOR REFERENCE ONLY)	Trimmer capacitor
C167 thru C169		Not used	
C170		Same as C120	B+ bypass, r-f stage
C171		Same as C115	Heater circuit bypass mixer stage
C172		Same as C115	B+ bypass V105
C173		Same as C115	Heater circuit bypass V105
C174		Not used	
C175		Same as C109	Heater bypass V105
C176		Same as C109	R-f bypass T150

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
C177		Same as C115	B+ bypass mixer stage
C178		Same as C118	B+ bypass V122
C179 thru C180		Not used	
C181		CAPACITOR, VARIABLE: 1.0 to 14 mmf; 600 vdcw; 3/4 in. lg by 7/32 in. dia; mts by one 6-32 screw 7/8 in. lg, and Tinnernan nut; CADV No. 90787-1 (ND)	I-f attenuator trimmer
C182		CAPACITOR, VARIABLE: 8 to 50 mmf; 350 vdcw; 3/4 in. lg by 17/32 in. w by 19/32 in. thk; two solder lug terminals; two 0.120 in. dia mtg holes in base on 5/16 in. centers; screwdriver slot adjustment; plastic base; spec JAN-C-20A; CER No. 557; CADV No. 10787 (ND)	Attenuator series element
C183		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 330 mmf ±1% 500 vdcw; max dim. 0.40 in. lg by 0.25 in. w by 0.24 in. thk; Vitramon type 71; CADV No. 10666-331 (ND)	Attenuator shunt element
C184		Same as C118	R-f bypass, T152 primary
C185		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 47 mmf ±1%; 500 vdcw; max dim. 0.40 in. lg by 0.25 in. w by 0.24 in. thk; axial wire leads 1-1/4 in. lg; Vitramon type 71; CADV No. 10704-470 (ND)	Tuning capacitor T152 primary
C186		Same as C115	Heater bypass V106
C187		Same as C118	Cathode bias bypass V106
C188		Same as C115	Relay B+ bypass
C189		Same as C115	Cathode bias bypass, V106
C190		Same as C115	Agc bypass V107
C191		CAPACITOR, FIXED, CERAMIC DIELECTRIC: disc type; 2000 mmf +100%; 500 vdcw; 3/8 in. max dia by 1/8 in. thk; radial wire leads 1-3/4 in. max lg; color, red; markings "ER" and "0.002"; CER No. 801.002; CADV No. 10668 (ND)	Agc bypass V107
C192		Same as C115	Relay B+ bypass
C193		Same as C118	Screen bypass V106

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
C194		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 mmf; GA (MRC) tolerance; 500 vdcw; standoff type; 11/16 in. lg (including 0.181 in. lg solder terminal and 5/16 in. lg 6/32 mtg thd; capacitor body hexagon shape; max dia 0.288 in. non-removable lockwasher; CSF No. 507C-1000; CADV No. 10665 (ND)	R-f bypass T152 secondary
C195		Same as C115	B+ bypass V107
C196		Same as C185	Tuning capacitor T153 primary
C197		Same as C118	Cathode bias bypass V107
C198		Same as C115	Cathode bias bypass V107
C199		Same as C115	Heater bypass V107
C200		Same as C115	Agc bypass V108
C201		Same as C118	R-f bypass T153 primary
C202		Same as C118	Relay B+ bypass
C203 thru C204		Not used	
C205		Same as C194	R-f bypass T153 secondary
C206		Same as C118	Screen bypass V107
C207		Not used	
C208		Same as C191	Agc bypass V108
C209		Same as C118	Cathode bias bypass V108
C210		Same as C115	Cathode bias bypass V108
C211		Same as C115	Heater bypass V108
C212		Same as C185	Tuning capacitor T154 primary
C213		Same as C115	B+ bypass V108
C214		Same as C118	R-f bypass T154 primary

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
C215		Same as C118	Screen bypass V108
C216		Not used	
C217		Same as C115	B+ bypass V109
C218		Same as C185	Tuning capacitor T155 primary
C219 thru C220		Not used	
C221		Same as C115	Cathode bias bypass V109
C222		Same as C118	Cathode bias bypass V109
C223		Same as C118	B+ bypass V109
C224		Same as C115	Heater bypass V109
C225		Same as C118	R-f bypass T155 primary
C226		Same as C118	Screen bypass V109
C227		Not used	
C228		Same as C115	B+ bypass V109
C229		Same as C115	Heater bypass V109
C230		Same as C118	Heater bypass V109
C231		Same as C118	Cathode bypass V110
C232		Same as C115	B+ bypass V110
C233		Same as C115	Heater bypass V110
C234		Same as C118	Bucking bias bypass V111
C235		Same as C115	Bucking bias bypass V111
C236		Not used	
C237		Same as C183	V110 neutralizing capacitor
C238		Same as C191	Screen coupling V110

* (ND) No Stoddart drawning.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
C239		Same as C185	Tuning capacitor T156 primary
C240		Same as C118	B+ bypass V110
C241		Same as C194	R-f bypass T156 secondary
C242		Not used	
C243		Same as C115	Agc bypass V111
C244		Same as C115	Agc bypass V111
C245		Not used	
C246		CAPACITOR, FIXED, CERAMIC DIELECTRIC: feedthru type; 10 mmf ±10%; 1000 vdcw; 5/8 in. lg by 5/16 in. hex; two axial soft wire leads max length each 1-5/16 in.; body of capacitor threaded for 12-28 nut; CER No. 362; CADV No. 10389 (ND)	R-f bypass V111
C247		Same as C191	Plate coupling V112
C248		Same as C118	R-f bypass V111
C249		Same as C115	R-f bypass V111
C250		CAPACITOR, FIXED, PAPER DIELECTRIC: 100,000 mmf ±10%; 400 vdcw; two radial wire leads one end of capacitor, both insulated from case; hermetically sealed metal case 1-1/16 in. lg by 13/32 in. dia; mtg bracket on lead end; bracket has 0.136 in. hole for 4-40 mtg screw; CSF No. 10899-42054; CADV No. 10669 (ND)	FI weighting circuit, V111
C251		Not used	
C252		Same as C118	B+ bypass V112
C253		Same as C115	B+ bypass V112
C254		Same as C246	R-f bypass V111
C255		Same as C115	R-f bypass V111
C256 thru C258		Not used	
C259		CAPACITOR, FIXED, PAPER DIELECTRIC: 50,000 mmf −10% +20%; 200 vdcw; hermetically sealed metal case; vinylite covering; wax impregnated; two axial wire leads, one common to metal case, one insulated; lead length 2-1/2 in. max; max case dim. 3/4 in. lg by 3/8 in. dia; "Stoddart", value and working voltage marked on case; CAMD-ME; CADV No. 10196	Audio coupling to V113
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
C260		Same as C118	Screen bypass V113
C261		CAPACITOR, FIXED, PAPER DIELECTRIC: 47,000 mmf ±20%; 300 vdcw; hermetically sealed metal case with vinylite covering; wax impregnated; two axial wire leads max length 2-1/4 in., one common to case; case dim. 13/16 in. lg by 0.40 in. dia; Westcap No. 13M3473; CADV No. 10670 (ND)	Compensating V113
C262		CAPACITOR, FIXED, PAPER DIELECTRIC: 100,000 mmf −10% +20%; 400 vdcw; hermetically sealed metal case; 1-1/8 in. lg by 7/16 in. dia; wax impregnated; 2 axial wire leads externally grounded; marked "Stoddart" 10101 on case; CAMD-ME; CADV No. 10101	Audio coupling to V114
C263		Not used	
C264		CAPACITOR, FIXED, ELECTROYTIC: tantalum; 5.0 mfd −15% +50%; 50 vdcw; 31/64 in. lg by 7/32 in. max dia; mts by two axial wire leads 1-1/2 in. lg; marked with mfr part No. and capacitor polarity; CATD No. PP5B50A2; CADV No. 10677 (ND)	Cathode bypass V114
C265		Same as C259	R-f bypass J108
C266		Same as C259	Audio coupling to V115
C267		CAPACITOR, FIXED, PAPER DIELECTRIC: 100,000 mmf +20%; 200 vdcw; hermetically sealed metal case 7/8 in. lg by 5/16 in. dia; two axial wire leads 1-7/8 in. lg, insulated from case; vinylite case covering; Westcap No. 12M2104; CADV No. 10678 (ND)	Cathode bypass V115
C268		Same as C118	Screen bypass V115
C269		Same as C118	R-f bypass T157 primary
C270		Same as C118	R-f bypass V116
C271		Same as C191	Audio coupling to V116
C272		Same as C118	Plate coupling V116
C273		Same as C118	Plate coupling V116
C274		Same as C118	Audio coupling to V117
C275		Same as C118	Cathode bypass V117
C276		Same as C118	Screen bypass V117
C277		Same as C118	R-f bypass J110
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
C278		Same as C118	R-f bypass J111
C279 thru C280		Not used	
C281		CAPACITOR, FIXED, CERAMIC DIELECTRIC: tubular; 330 mmf −20% at −40°, +10% at 85°C; 500 vdcw; molded phenolic insulation; 0.562 in. lg by 0.250 in. dia max dim.; CER No. GP2K-331; CADV No. 10667-331 (ND)	Heater voltage coupling V121
C282		Not used	
C283		Same as C118	R-f bypass Z107
C284		Same as C250	Audio bypass V121
C285		Same as C118	Plate coupling V121
C286		Same as C118	Plate coupling V121
C287		Same as C118	Audio bypass V121
C288		Not used	
C289		Same as C118	Audio bypass R230
C290		Same as C118	Audio coupling S102
C291		Same as C191	Rectifier bypass CR101
C292 thru C299		Not used	
CR101		SEMICONDUCTOR DEVICE DIODE: germanium diode; type 1N63; 1/2 in. lg by 0.220 in. max dia; mounts by two axial wire leads 1 in. lg; CG No. 1N63; CADV No. 10679 (ND)	Pulse stretcher diode, S102
E101		TUBE SHIELD ASSEMBLY: sub-miniature; beryllium copper, silver plated; 1-1/2 in. lg by 1 in. w by 27/64 in. h; CADV No. 90830-1	V101, V102 shield
E102		Same as E101	V103, V104 shield
E103		TUBE SHIELD ASSEMBLY: sub-miniature; beryllium copper, silver plated; 1-1/2 in. lg by 1 in. w by 27/64 in. h; CADV No. 90829-1	V105 shield
E104		Not used	
E105		Not used	
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
E106		SHIELD, TUBE: brass nickel plated; tubular; open top; bayonet type mtg; 0.810 in. ID by 0.941 in. OD by 1-3/4 in. lg; internal tension spring for retaining tube in socket; spec JAN-S28A; ELCO No. 120; CADV No. 10116 (ND)	V106 shield
E107		Same as E106	V107 shield
E108		Same as E106	V108 shield
E109		Same as E106	V109 shield
E110		SHIELD, TUBE: brass nickel plated; 2-1/4 in. lg by 0.810 in. ID by 0.941 OD; internal tension spring for retaining tube in socket; tubular open top; bayonet type mtg; for 7-pin miniature socket; spec JAN-S-28A; JAN TS102U03; CEB No. 9702-11; CADV No. 10039 (ND)	V110 shield
E111		SHIELD, TUBE: JAN type TSFOT101; brass nickel plated; tubular open top cylindrical twist-on mtg slots for attaching to JAN style No. 10 and No. 11 tube sockets; 1/2 in. ID by 1-3/8 in. lg by 0.941 in. OD; internal tension spring for retaining tube in socket; spec JAN-S-28A; ELCO No. 121; CADV No. 10113 (ND)	V111 shield
E112		Same as E106	V112 shield
E113		Same as E106	V113 shield
E114		Same as E106	V114 shield
E115		Same as E106	V115 shield
E116		SHIELD, TUBE: brass nickel plated; tubular, open top; bayonet type mtg; 1-15/16 in. lg by 1.05 in. OD by 0.950 in. ID; internal tension spring for retaining tube in socket; spec JAN-S-28A; ELCO No. 191; CADV No. 10410 (ND)	V116 shield
E117		Same as E106	V117 shield
E118		KNOB, TUNING CRANK ASSEMBLY: consists of tuning crank, knob and stud; overall dim. 25/32 in. deep by 1-1/16 in. OD; tuning crank and stud 17S-T4 aluminum; black anodized; knob black phenolic grade XR; engraved with letter H, 3/16 in. h, white filled; CADV No. 20427-1	Tuning knob
E119		Same as E106	V119 shield
E120		Same as E106	V120 shield
E121		Same as E116	V121 shield
E122		Same as E110	V122 shield
E123		KNOB: round fluted; black phenolic; for 1/4 in. dia shaft; double 10/32 set screw, 90° apart; white filled indicator dot and letter A, 3/16 in. h; 1-5/8 in. dia by 3/4 in. h overall; brass insert; depth of shaft hole 1/2 in.; CAUP-S-309-64-DL-522; CADV No. 20424-1	Attenuator knob

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
E124 thru E127		Not used	
E128		CAP, CONNECTOR: AN type CW-123/U; for UG-290/U; max dim. 11/16 in. lg by 9/16 in. dia; has internal neoprene seal; chain with screw eye 2-1/4 in. lg, brass nickel plated; cap, brass, silver plated; CARO-LPC-1500; CADV No. 10261 (ND)	Cover for J107
E129		KNOB: bar, black phenolic; for 1/4 in. dia shaft; double 6-32 set screw, 90° apart; white filled arrow marking and engraved letter B, 3/16 in. h; 1-1/8 in. lg by 11/16 in. w overall; brass insert; depth for shaft hole 1/2 in; DMC-46A41091; CADV No. 20426-1	"Function switch" knob
E130		KNOB: round; type CMG melamine resin; black; for 1/4 in. dia shaft; double 6-32 set screw, 90° apart; engraved letter F, 3/16 in. h, white filled; 1 in. dia by 1/2 in. h overall; shaft hole 13/32 in. d; fine straight knurl; CADV No. 20425-4	"Audio" control knob
E131		KNOB: bar, black phenolic; for 1/4 in. dia shaft; double 6-32 set screw, 90° apart; engraved letter G, white filled 3/16 in. h; 1-1/4 in. lg by 3/4 in. w max dim.; depth of shaft hole 1/2 in.; CADV No. 20423-1	"Bandswitch" knob
E132		KNOB: round; type CMG melamine resin; red; for 1/4 in. dia shaft; double 6-32 set screw, 90° apart; engraved letter D, white filled, 3/16 in. h; 1 in. dia by 1/2 in. overall; shaft hole 13/32 in. d; fine straight knurl; CADV No. 20425-3	"Calibrate" knob
E133		KNOB: round; type CMG melamine resin; green; for 1/4 in. dia shaft; double 6-32 set screw, 90° apart; engraved letter C, white filled, 3/16 in. h; 1 in. dia by 1/2 in. h overall; shaft hole 13/32 in. deep; fine straight knurl; CADV No. 20425-1	"Peak" knob
E134		KNOB: round; type CMG melamine resin; green; for 1/4 in. dia shaft; double 6-32 set screw, 90° apart; engraved letter E, white filled, 3/16 in. h; 1 in. dia by 1/2 in. h overall; shaft hole 13/32 in. d; fine straight knurl; CADV No. 20425-2	"Peak sensitivity" knob
E135		Not used	
E136		NETWORK, IMPEDANCE MATCHING: consists of single tubular film type fixed resistor (50 ohms) mtd at middle of coaxial tube, with metal taper for impedance match; used for terminating 50-ohm coaxial line; 9/16 in. OD by 3 in. lg overall; has special 50-ohm r-f connector on ea end; p/o CADV No. 90802-1; CADV No. 90831-1	Used in calibrate position
E137		TRANSMISSION LINE SECTION: r-f transmission 9/16 in. OD by 3 in. lg overall; has special 50-ohm r-f connector on ea end; p/o CADV No. 90802-1; CADV No. 90388-1	X1 attenuator position
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
E138		Same as E137	X10 attenuator position
E139		RESISTOR ASSEMBLY, FIXED: consists of T-section attenuator using two series tubular film type resistors 40.91 ohms ea and one shunt film resistor (disc) 10.1 ohms; mtd in coaxial tube with metal tapers for impedance match; attenuates 20 db; 9/16 in. OD by 3 in. lg overall; has special 50-ohm r-f connector on ea end; p/o CADV No. 90802-1; CADV No. 90389-1	$X10^2$ attenuator
E140		RESISTOR ASSEMBLY, FIXED: consists of T-section attenuator using two series tubular film type resistors 49.01 ohms ea and one shunt film resistor (disc) 1.0 ohm; mtd in coaxial tube with metal tapers for impedance match; attenuates 40 db; 9/16 in. OD by 3 in. lg overall; has special 50-ohm r-f connector ea end; p/o CADV No. 90802-1; CADV No. 90389-2	$X10^3$ attenuator position
E141		RESISTOR ASSEMBLY, FIXED: consists of T-section attenuator using two series tubular film type resistors 49.9 ohms ea and one shunt film resistor (disc) 0.1000 ohm; mtd in coaxial tube with metal tapers for impedance match; attenuates 60 db; 9/16 in. OD by 3 in. lg overall; has special 50-ohm r-f connector ea end; p/o CADV No. 90902-1; CADV No. 90389-3	$X10^4$ attenuator position
E142		Not used	
E143		SHELL, CONNECTOR, JUNCTION: for P104; Cannon type DB; for use with DB-25 connector; steel, gold plated; 2-1/2 in. lg by 0.431 in. thk by 41/64 in. h; 0.875 in. wire opening; CED-DB; CADV No. 10612 (ND)	Shell for P104
E144		SHELL, CONNECTOR, JUNCTION: 3/4 in. lg by 15/32 in. max dia; 5/32 in. wire opening; molded melamine; Winchester Electronics No. H-10; CADV No. 10615 (ND)	Hood for P109
E145 thru E299		Not used	
H101 thru H108		Not used	
H109		WRENCH, TUNING: CZR No. 68-21; CADV No. 50625	R-f head tuning tool
H110		COVER, TELEPHONE JACK: cold-rolled steel; satin chrome finish; 1-1/32 in. lg by 13/16 in. w by 17/32 in. thk; mts by 0.386 in. dia hole with single locknut; cover contains neoprene pad; opens 90°; for plugs to 5/8 in. body dia; spring loaded cap; CAHW-A-23559; CADV No. 91115-1	Remote meter jack cover

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
H111		Same as H110	Recorder jack cover
H112		Same as H110	Telephone jack cover
H113		GASKET: shaft seal; 0.230 in. ID; silicone rubber; modified CAOR-H1268; CADV No. 20314-2	Tuning shaft seal
H114		Same as H113	Attenuator shaft seal
H115		Same as H114	Audio shaft seal
H116		Same as H114	Function switch shaft seal
H117		Same as H114	Bandswitch shaft seal
H118		GASKET: shaft seal; 0.250 in. ID; silicone rubber; modified CAOR-H1268; CADV No. 20314-3	Peak sensitivity shaft seal
H119		Same as H118	Calibrate shaft seal
H120		Same as H118	Peak shaft seal
H121		NUT, SEAL: 3/8-32; has flange for shaft seal gasket; CAOR No. HA-1262; CADV No. 70163 (ND)	Peak sensitivity shaft seal
H122		Same as H121	Gasket
H123		Same as H121	Calibrate control gasket
H124		Same as H121	Peak control gasket
H125		Same as H121	Audio control gasket
H126		GASKET, RECEPTACLE: shoulder cover; neoprene; 5 holes; square; 1 in. by 1 in. by 0.031 in. thk; CADV No. 20142	Antenna receptacle gasket
H127		GASKET, RECEPTACLE: shoulder cover; neoprene; 5 holes; square; 11/16 in. by 11/16 in. by 0.031 in. thk; CADV No. 20143	Oscilloscope jack gasket
H128		GASKET, CONNECTOR: shoulder cover; neoprene; 5 holes square; 1-3/16 in. by 1-3/16 in. by 1/32 in. thk; CADV No. 20063	Power receptacle gasket
H129		GASKET: neoprene rod; 3/32 in. dia by 28 in. lg; CADV No. 20285 (ND)	Instrument case gasket
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
H130		GASKET: "O" ring, neoprene; CAOR-HA1264; CADV No. 70164 (ND)	Used with H121
H131		Same as H130	Used with H122
H132		Same as H130	Used with H123
H133		Same as H130	Used with H124
H134		Same as H130	Used with H125
H135		WRENCH, ALLEN: for No. 6 Allen set screw; 1-3/4 in. lg by 9/16 in. across flats; solid six point hex; CAYT No. 6; CADV No. 70131 (ND)	Set screw wrench
H136		WRENCH, ALLEN: for No. 8 Allen set screw; 2 in. lg by 11/16 in. dia; 0.0775 in. across flats; solid six point hex; CAYT No. 8; CADV No. 70058 (ND)	Set screw wrench
H137		WRENCH, ALLEN: for No. 10 Allen set screw; 2-1/16 in. lg by 3/4 in.; 1/16 in. across flats; solid six point hex; CAYT No. 10; CADV No. 70242 (ND)	Set screw wrench
H138 thru H299		Not used	
I101		LAMP, INCANDESCENT: Sig C LM-52; 6-8 volts; 0.15 amp; bulb T-3-1/4 clear; 1-3/16 in. lg overall; miniature bayonet base; C2 filament; burn any position; CG No. GE-47; CADV No. 10051 (ND)	Tuning dial illumination
I102		LAMP, GLOW: indicator type; NE-48; CG No. NE-48; CADV No. 10726 (ND)	Visual null indicator
J101		CONNECTOR, RECEPTACLE: one round female contact; coaxial, straight type; 5/8 in. dia; part of Z114 isolating capacitor assembly (LISTED FOR REFERENCE ONLY; SEE Z114)	RF INPUT receptacle
J102		CONNECTOR, ADAPTER: right angle; male one end; female other end; 1-15/64 in. h by 3/8 in. w by 11/16 in. dia; basic internal construction identical to UG-27A/U; one end threaded 5/8-24 thread; cylindrical brass body, silver plated; p/o Z113; CANS No. KN-9901; CADV No. 10356	Attenuator input
J103		CONNECTOR, PLUG: male; 25 contacts, copper base alloy; gold plated contacts; DuPont molded nylon FM-10001 insulating material; 2-5/64 in. lg by 31/64 in. w by 27/64 in. thk; CED No. DB-25P; CADV No. 10732 (ND)	I-f chassis power
J104		CONNECTOR, RECEPTACLE: one round female contact; coaxial, straight type; 5/8 in. dia; part of Z114 isolating capacitor assembly (LISTED FOR REFERENCE ONLY; SEE Z114)	Connects attenuator input cable to Z114 isolating capacitor assembly

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
J105		CONNECTOR, RECEPTACLE: similar to AN Receptacle UG-290/U; one round male contact; straight type; 11/16 in. by 11/16 in. square by 1-1/16 in. lg overall; 500 volts peak; non-constant impedance; cylindrical brass body; silver plated square mtg plate 0.90 in. thk with four No. 3-56 tapped holes; weatherproof; same as J107 except flange is chamfered; CARO-UG-290/U modified; CADV No. 10616	I-f input
J106		CONNECTOR, RECEPTACLE: 5 round male contacts; polarized straight; 7/8 in. OD by 1-1/4 in. lg less plug prong; cylindrical aluminum body; clear lacquer finish; molded synthetic rubber insert; four 0.120 in. dia mtg holes 29/32 in. between mtg centers; 7/8-20 NEF-2 thread; electrostatic shielding between receptacle and matching plug is sphere and cone type; CED No. GA-3102E-14S-5P (105A); CADV No. 11178 (ND)	Power receptacle
J107		CONNECTOR, RECEPTACLE: AN receptacle UG-290/U; one round male contact; straight type; 11/16 in. by 11/16 in. square by 1-1/16 in. lg overall; 500 volts peak; non-constant impedance; cylindrical brass body; silver plated; square mtg plate 0.90 in. thk with four No. 3-56 tapped holes; weatherproof; CARO 2700; CADV No. 10121 (ND)	Oscilloscope output
J108		JACK, TELEPHONE: Navy type (-49025A); for two-conductor plug; 0.25 in. dia by 1-3/16 in. lg by 1 in. by 3/4 in. h; J1 contact arrangement; mtg bushing 3/8 in.-32 thread by 9/32 in. lg with hex mtg nut; 3/8 in. mtg hole; CMA JK-34A; CADV No. 10122 (ND)	Headphone jack
J109		CONNECTOR, POWER: male; 4 gold plated contacts phosphor bronze; has lock ring and ground lug; molded melamine body; overall length 19/32 in.; hexagon shape, max width 15/32 in.; breakdown voltage 2500 v dc; Winchester Electronics M4P-LF; CADV No. 10613	R-f power connector
J110		JACK, TELEPHONE: Navy type (-491957); for three-conductor plug; accommodates PL-68; 1-3/16 in. lg by 3/4 in. dia overall; 3/8 in. mtg hole; CBIM2J-1047A; CADV No. 10123	Remote meter jack
J111		Same as J110	Recording meter jack
J112		CONNECTOR, RECEPTACLE: one round female contact; coaxial type N; straight type; 5/8 in. dia; part of switch S101 (LISTED FOR REFERENCE ONLY; SEE S101)	R-f output connector at S101
J113		CONNECTOR, RECEPTACLE: one round female contact; coaxial type N; straight type; 5/8 in. dia; part of switch S101 (LISTED FOR REFERENCE ONLY; SEE S101)	Impulse noise calibrator input connector at S101
J114		CONNECTOR, PLUG: AN type UG-625/U; CADV No. 10727	Terminal connector for low-pass filter

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
J115		Same as J114	Terminal connector for low-pass filter
J116 thru J299		Not used	
K101		RELAY: double pole, double throw; dc; 30 volts, 3 amp; one coil winding; d-c winding resistance 4700 ohms; operating voltage 38.6 to 42.0 v dc at 23°C; continuous duty; hermetically sealed; 15/16 in. sq by 1-3/32 in. max less mtg studs and terminals; mounts by two 4-40 threaded studs ea 1/4 in. lg; eight "J" shaped wire terminals fixed circularly in glass bead-type insulators in sealed base; 50 "G" shock test; operating temperature range -55°C to +85°C; CJN No. IR-207-38; CADV No. 10618 (ND)	Introduces 20 db attenuation at first intermediate frequency
L101		CHOKE, R-F: filament, 21 turns No. 25 Formvar, 3/32 in. ID by 1/2 in.lg; CADV No. 10617	Filament choke V101, V102
L102		Same as L101	Filament choke V103, V104
L103		Same as L101	Filament choke V105
L104		CHOKE, R-F: 10 microhenries at 7.9 mc test frequency; single pi universal wound; unshielded; d-c resistance 2.25 ohms; 7/32 in. OD by 3/64 in. w; phenolic form; 11/32 in. lg by 1/8 in. OD; pigtail leads 1-17/32 in.; wax impregnated; CADV No. 10360	R-f choke, T156 secondary
L105		Same as L104	R-f choke V111 output
L106		CHOKE, R-F: 120 microhenries; solenoid type, iron core; 25/32 in. lg by 9/32 in. dia; two axial wire leads 1-5/16 in. lg; CAUZ-10404-36; CADV No. 10692 (ND)	R-f choke V111 output
L107		CHOKE, R-F: 19 millihenries; single pi universal wound; unshielded; CADV No. 90825-1	R-f choke at audio output
L108 thru L299		Not used	
M101		METER, MULTI-SCALE: dc; 0-1 ma; fan-shaped steel case 4-7/16 in. h by 5-5/8 in. w by 1-13/32 in. d; ±1% accuracy for full scale reading; 1450 ohms ±10% internal resistance; calibrated for non-magnetic panel; high speed response; black printing on white background; 26 divisions on 0-100 microvolt scale; 40 divisions for 0.40 db scale; lance type pointer; mts by two binding post terminals 3/8-24 thread, 11/16 in. lg; CV-269; CADV No. 10702	Microvolt and db meter
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
N101		CHART SET: AN Chart Set PT-188/URM-47; calibration; not calibrated; vinylite 8-1/2 in. lg by 5-1/2 in. w by 0.015 in. thk; black printing on white background; plastic ring binder; CADV No. 91036-1 (ND)	Calibration chart set
O101		DETENT-SHAFT-GEAR RIVET ASSEMBLY: CADV No. 90870-1	Bandswitch detent
O102		DRIVE GEAR ASSEMBLY: CADV No. 90890-1 (ND)	Bandswitch and tuning gear
O103		Same as O102	Bandswitch and tuning gear
O104		Same as O102	Bandswitch and tuning gear
O105		Same as O102	Bandswitch and tuning gear
O106		Same as O102	Bandswitch and tuning gear
O107		Same as O102	Bandswitch and tuning gear
O108		Same as O102	Bandswitch and tuning gear
O109		DRIVE GEAR: CADV No. 50507	Bandswitch and tuning gear
O110		Same as O109	Bandswitch and tuning gear
O111		Same as O109	Bandswitch and tuning gear
O112		Same as O109	Bandswitch and tuning gear
O113		Same as O109	Bandswitch and tuning gear
O114		Same as O109	Bandswitch and tuning gear
O115		Same as O109	Bandswitch and tuning gear
O116		BANDSWITCH CONTROL SHAFT ASSEMBLY: CADV No. 90891-2 (ND)	Bandswitch control
O117		DIAL ASSEMBLY: CADV No. 90892-1 (ND)	Frequency dial
O118		COUNTER SHAFT-FRICTION DISC ASSEMBLY: CADV No. 90893-1 (ND)	Dial drive

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
O119		COUNTER SHAFT GEAR: CADV No. 50514	Tuning drive gear
O120		IDLER GEAR: CADV No. 50515	Bandswitch idler gear
P101		CONNECTOR, PLUG: r-f coaxial type; male; 1 contact; straight; 3/4 in. OD by 15/16 in. lg overall; cylindrical brass body, silver plated; Type "N"; coupling nut; CADV No. 90399-1	Connects to r-f attenuator
P102		Same as P101 (p/o W103)	Connects to S101 r-f output
P103		CONNECTOR, PLUG: AN type UG-88/U; CADV No. 10084 (ND)	Connects to i-f amplifier input
P104		CONNECTOR, RECEPTACLE: 25 contacts, copper base alloy, gold plated; DuPont molded nylon FM-10001 insulating material; 2-5/64 in. lg by 31/64 in. w by 27/64 in. thk; CED No. DB-255; CADV No. 10683 (ND)	I-f chassis power connector
P105		Same as P101	Connects to coaxial switch (p/o W102)
P106		Same as P101	Connects to output of attenuator pad E142 (p/o W102)
P107		Same as P103	Connects W103 to Z115
P108		Same as P103	Connects r-f head to Z115
P109		CONNECTOR, RECEPTACLE: 4 contacts; phosphor bronze gold plated; has lock ring and ground lug; molded melamine body; overall length, including terminal lugs, 19/32 in.; hex shape; max width 19/32 in.; breakdown voltage 2500 v dc; Winchester Electronics No. M4S-LRN; CADV No. 10614	R-f head power input
P110		Same as P101	Connects Z114 to attenuator input
P111 thru P299		Not used	
R101		RESISTOR, FIXED, COMPOSITION: MIL RC20GF393J; 39,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB3935; CADV No. 10011-393 (ND)	Screen dropping V101
R102		RESISTOR, FIXED, COMPOSITION: 100,000 ohms ±5%; 1/4 watt; 1/4 in. lg by 1/16 in. dia; uninsulated; two radial wire lead terminations; CCO No. 997A-104; CADV No. 10693-104 (ND)	Grid bias decoupling, V101, V102

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
R103		RESISTOR, FIXED, COMPOSITION: 220,000 ohms ±5%; 1/4 watt; 1/4 in. lg by 1/16 in. dia; uninsulated; two radial wire lead terminations; CCO No. 997A-224; CADV No. 10693-224 (ND)	Grid bias decoupling, V101
R104		Same as R103	Grid bias decoupling V102
R105		Same as R101	Screen dropping V102
R106		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-272J; 2700 ohms ±5%; 1/2 watt; spec MIL-R-11; CEB-EB-2725; CADV No. 10011-272 (ND)	Plate dropping V101, V102
R107		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-222J; 2200 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-2225; CADV No. 10011-222 (ND)	Plate dropping V101, V102
R108		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-152J; 1500 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1525; CADV No. 10011-152 (ND)	Voltage divider V101, V102 grid bias
R109		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-104J; 100,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1045; CADV No. 10011-104 (ND)	Voltage divider V101, V102 grid bias
R110		Not used	
R111		Same as R103	Grid return V103
R112		Same as R103	Grid return V104
R113		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-684J; 680,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-6845 CADV No. 10011-684 (ND)	Screen dropping V103
R114		Same as R113	Screen dropping V104
R115		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-102J; 1000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1025; CADV No. 10011-102 (ND)	Decoupling, V105 (B+)
R116		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-101J; 100 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1015; CADV No. 1011-101 (ND)	Isolating resistor Z215
R117		Same as R116	Isolating resistor Z216
R118		Same as R116	Isolating resistor Z235
R119		Same as R116	Isolating resistor Z236
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
R120		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-103J; 10,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1035; CADV No. 10011-103 (ND)	Grid bias V106
R121		RESISTOR, FIXED, WIREWOUND: 1500 ohms ±5%; 25 watts; 1/16 in. lg less terminal lugs; lugs 7/16 in. lg, one located axially ea end; die cast black anodized radiator-finned housing, 1/2 in. dia mtg lugs 9/32 in. extended ea side; mts by two No. 6 screws; Dale Products Co., Inc. No. RH-25-1500; CADV No. 10705-152 (ND)	Dropping resistor V122
R122		Not used	
R123		RESISTOR, FIXED, COMPOSITION: 33 ohms ±10%; 1/4 watt; not rated for ambient temperature; "E" characteristic; 1/4 in. lg by 1/16 in. dia; uninsulated two radial wire leads; CCO No. 997-330; CADV No. 10693-330 (ND)	Cathode lead at V105
R124		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-392J; 3900 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-3925; CADV No. 10011-392 (ND)	Grid bias at V105
R125		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-563J; 56,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-5635; CADV No. 10011-563 (ND)	Plate dropping resistor at V103, V104
R126		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-151J; 150 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1515; CADV No. 10011-151 (ND)	Cathode bias, V106
R127		RESISTOR, FIXED, COMPOSITION: MIL RC30GF184J; 180,000 ohms ±5%; one watt; spec MIL-R-11; CBZ No. GB-1845; CADV No. 10012-184 (ND)	Voltage divider, CAL control
R128		RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms ±10%; 2 watts; 100°C max continuous operation; 3 lug terminals; 1-1/16 in. dia by 9/16 in. d; enclosed body; shaft 1/4 in. dia by 3/4 in. from mtg surface; plain round U taper; insulated contact arm; normal torque; bushing 3/8-32 by 1/4 in. lg; CBZ-JU-1031; CADV No. 10408 (ND)	CAL control
R129		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-332J; 3800 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-3325; CADV No. 10011-332 (ND)	Agc decoupling T153 secondary
R130		Same as R127	Screen dropping resistor at V106
R131		Same as R116	B+ decoupling V106
R132		Same as R126	Cathode bias at V107
R133		Same as R129	Agc decoupling T153 secondary

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
R134		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-683J; 68,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-6835; CADV No. 10011-683 (ND)	Screen dropping at V107
R135		Same as R116	B+ decoupling V107
R136		Same as R126	Cathode bias at V108
R137		RESISTOR, VARIABLE, COMPOSITION: 5000 ohms ±10%; locking type; 1/2 watt; 100°C max continuous operation; 3 solder lug terms; enclosed molded phenolic case 0.840 in. dia by 0.280 in. d; insulated contact arm; normal torque; lockbushing; CBZ-No. TSLU5022; CADV No. 10694 (ND)	FI-10 control
R138		RESISTOR, FIXED, WIREWOUND: 10,000 ohms ±5%; 25 watts; 1-1/16 in. lg less terminal lugs; lugs 7/16 in. lg; one located axially ea end; die cast black anodized radiator finned housing 1/2 in. dia mtg lugs 9/32 in. extended ea side; mts by two No. 6 screws; Dale Products Co., Inc. No. RH-25-10000; CADV No. 10705-103 (ND)	Relay voltage dropping resistor
R139 thru R141		Not used	
R142		RESISTOR, FIXED, COMPOSITION: MIL RC30GF-124J; 120,000 ohms ±5%; 1 watt; spec MIL-R-11; CBZ-GB-1245; CADV No. 10012-124 (ND)	Voltage divider with FI-10 control
R143		Same as R134	Screen dropping V108
R144		Same as R116	B+ decoupling, V108
R145		Same as R126	Cathode bias resistor
R146		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-271J; 270 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-2715; CADV No. 10011-271 (ND)	B+ decoupling, V109
R147		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-473J; 47,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-4735; CADV No. 10011-473 (ND)	Screen dropping, V109
R148		Not used	
R149		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-560J; 560 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-5615; CADV No. 10011-561 (ND)	Cathode bias V110
R150		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-273J; 27,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-2735; CADV No. 10011-273 (ND)	Screen dropping, V110

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
R151		Same as R115	B+ decoupling T156 primary
R152		Same as R108	B+ dropping resistor for dynamic range adjust
R153		RESISTOR, VARIABLE, COMPOSITION: 10,000 ohms ±10%; 2 watts; 100°C max continuous operation; 3 solder lug terms; enclosed molded phenolic case; 1-1/16 in. dia by 9/16 in. d; slotted metal shaft 1/4 in. dia by 5/8 in. lg from mtg surface; U taper; insulated contact arm; normal torque; lock-bushing 3/8-32 by 1/2 in. lg; non-turn device located at 17/32 radius at 9 o'clock; CBZ type "J" CADV No. 10252 (ND)	Dynamic range adjust
R154 thru R160		Not used	
R161		Same as R125	Grid bias, V112
R162		Not used	
R163		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-565J; 5.6 megohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-5655; CADV No. 10011-565 (ND)	FI weighting circuit, V111
R164		Same as R150	Load resistor V111
R165		Same as R109	Grid return, V115
R166		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-105J; 1.0 megohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1055; CADV No. 10011-105 (ND)	Grid return, V113
R167 thru R176		Not used	
R177		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-181J; 180 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1815; CADV No. 10011-181 (ND)	Cathode bias V113
R178		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-121J; 120 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1215; CADV No. 10011-121 (ND)	Cathode bias V115
R179		Same as R150	Screen dropping V113
R180		RESISTOR, FIXED, COMPOSITION: MIL RC32GF-822J; 8200 ohms ±5%; 1 watt; spec MIL-R-11; CBZ-GB-8225; CADV No. 10012-822 (ND)	Plate load, V113
R181		Same as R180	Plate load, V113
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
R182		RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms ±10%; 2 watts max continuous rating; 3 solder lug terminals; metal enclosed case 1-1/16 in. dia by 9/16 in. d; round metal shaft 1/4 in. dia by 5/8 in. lg from mtg surface; linear U taper; no off position; normal torque; CBZ type "J"; CADV No. 10041	Audio control
R183		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-333J; 33,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-3335; CADV No. 10011-333 (ND)	Screen dropping, V115
R184		RESISTOR, FIXED, COMPOSITION: JAN RC32GF-823J; 82,000 ohms ±5%; 1 watt; spec JAN-R-11; CBZ-GB-8235; CADV No. 10012-823 (ND)	Voltage divider with peak sensitivity control
R185 thru R188		Not used	
R189		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-274J; 270,000 ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-2745; CADV No. 10011-274 (ND)	Grid resistor V116
R190		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-564J; 560,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-5645; CADV No. 10011-564 (ND)	Grid return V114
R191		RESISTOR, VARIABLE, COMPOSITION: 5000 ohms ±10%; 2 watts; 100°C max continuous operation; 3 lug terminals; 10-1/16 in. dia by 9/16 in. d; enclosed body; shaft 1/4 in. dia by 3/4 in. from mtg surface; taper B; insulated contact arm; normal torque; bushing 3/8-32 by 1/4 in. lg; CBZ type "J"; CADV No. 10646 (ND)	PEAK SENSITIVITY control
R192		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-153J; 15,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1535; CADV No. 10011-153 (ND)	Volt divider with PEAK SENSITIVITY control
R193		Same as R125	Plate load, V116
R194		Same as R150	Plate load, V116
R195		Same as R115	Cathode bias, V114
R196		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-474J; 470,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-4745; CADV No. 10011-474 (ND)	Grid bias, V116
R197		Same as R109	Grid bias, V116
R198		Same as R166	Integrating circuit resistor, V117
R199		Same as R150	Cathode bias, V116
R200		Same as R166	Grid return, V117

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
R201		Same as R116	Cathode bias, V117
R202		Same as R150	Screen dropping V117
R203		Same as R166	J107 loading
R204		RESISTOR, FIXED, COMPOSITION: MIL RC32GF153J; 15,000 ohms ±5%; 1 watt; spec MIL-R-11; CBZ-GB-1535; CADV No. 10012-153 (ND)	VTVM bias
R205		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-821J; 820 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-8215; CADV No. 10011-821 (ND)	Cathode bias, V119
R206		Same as R205	Cathode bias, V120
R207		Same as R134	Plate load, V117
R208 thru R210		Not used	
R211		RESISTOR, VARIABLE, COMPOSITION: 1/2 watt; miniature type; 25,000 ohms; 0.840 in. dia by 0.280 in. case thk; overall height 0.530 in.; three radial wire leads; CBZ No. TSLU2532; CADV No. 10685 (ND)	FI-100 control
R212		Same as R150	VTVM bridge
R213		Same as R153	ADJUST ZERO control
R214		Same as R150	VTVM bridge
R215		Same as R108	External meter compensating at J110
R216		Same as R108	External meter compensating at J111
R217 thru R220		Not used	
R221		Same as R116	B+ decoupling Z107
R222		RESISTOR, FIXED, COMPOSITION: MIL RC20GF335J; 3.3 megohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-335; CADV No. 10011-335 (ND)	Grid bias, V121
R223		Same as R222	Grid bias, V121

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
R224		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-183J; 18,000 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1835; CADV No. 10011-183 (ND)	Plate load, V121
R225		Same as R224	Plate load, V121
R226		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-681J; 680 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-6815; CADV No. 10011-681 (ND)	B+ decoupling V121
R227		Same as R115	C- decoupling, V121
R228		Same as R189	Voltage divider S102
R229		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-244J; 240,000 ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-2445; CADV No. 10011-244 (ND)	Voltage divider S102
R230		Same as R120	PEAK bias filter
R231		Same as R128	PEAK control
R232		Same as R134	Voltage divider with PEAK control
R233		RESISTOR, VARIABLE, COMPOSITION: 1/2 watt miniature type; 1000 ohms; 0.840 in. dia by 0.280 in. case thk; overall height 0.530 in.; three radial wire leads; CBZ No. TSLU 1022; CADV No. 10686 (ND)	QP-100 control
R234		Not used	
R235		Same as R137	FI BUCK control
R236		Same as R137	QP-1 control
R237		Same as R137	PEAK BUCK control
R238		RESISTOR, FIXED, COMPOSITION: MIL RC40GF-823J; 82,000 ohms ±5%; 2 watts; spec MIL-R-11; CBZ-HB-8235; CADV No. 10377-828 (ND)	Voltage divider for "bucking" controls
R239		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-471J; 470 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-4715; CADV No. 10011-471 (ND)	Cathode bias, V109
R240 thru R241		Not used	
R242		Same as R109	Voltage divider, V117 grid bias
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
R243		Same as R120	Voltage divider, V117 grid bias
R244		Same as R204	Plate dropping V112
R245		RESISTOR, FIXED, COMPOSITION: MIL RC20GF-100J; 10 ohms ±5%; 1/2 watt; spec MIL-R-11; CBZ-EB-1005; CADV No. 10011-100 (ND)	I101 series
R246 thru R299		Not used	
S101		SWITCH, COAXIAL: includes J112 and J113 which are integral and non-replaceable parts of this switch; 1-9/16 in. lg by 1-15/16 in. h by 49/64 in. thk; CADV No. 90801-1	Coaxial switch
S102		SWITCH, ROTARY: function; 5 sections, 5 positions; 30° throw; contacts and rotors solid silver; insulation 1/16 in. thk bakelite; stainless steel index plate and detent spring; nickel plated brass bushing; front shaft rotates in conventional manner positions 1 thru 5, rear shaft indexes one position ccw ea time front shaft rotates from position 2 to position 1; part number stamped on front plate; CADV No. 10482	Function switch
S103		SWITCH, SENSITIVE: single pole, single throw; 1-1/4 in. lg by 1/2 in. square not including terminals; terminal lugs 1/4 in. lg ea; CG "Switchette" No. CR-1070-C130D3; CADV No. 10688 (ND)	Attenuation relay switch
S104 thru S299		Not used	
T101		TRANSFORMER, RADIO FREQUENCY: antenna stage; p/o Z201 (LISTED FOR REFERENCE ONLY)	Antenna coil, band 1
T102		TRANSFORMER, RADIO FREQUENCY: antenna stage; p/o Z202 (LISTED FOR REFERENCE ONLY)	Antenna coil, band 2
T103		TRANSFORMER, RADIO FREQUENCY: antenna stage; p/o Z203 (LISTED FOR REFERENCE ONLY)	Antenna coil, band 3
T104		TRANSFORMER, RADIO FREQUENCY: antenna stage; p/o Z204 (LISTED FOR REFERENCE ONLY)	Antenna coil, band 4
T105		TRANSFORMER, RADIO FREQUENCY: antenna stage; p/o Z205 (LISTED FOR REFERENCE ONLY)	Antenna coil, band 5
T106		TRANSFORMER, RADIO FREQUENCY: antenna stage; p/o Z206 (LISTED FOR REFERENCE ONLY)	Antenna coil, band 6
T107 thru T110		Not used	

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
T111		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; p/o Z211 (LISTED FOR REFERENCE ONLY)	R-f stage plate circuit, band 1
T112		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; p/o Z212 (LISTED FOR REFERENCE ONLY)	R-f stage plate circuit, band 2
T113		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; p/o Z213 (LISTED FOR REFERENCE ONLY)	R-f stage plate circuit, band 3
T114		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; p/o Z214 (LISTED FOR REFERENCE ONLY)	R-f stage plate circuit, band 4
T115		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; p/o Z215 (LISTED FOR REFERENCE ONLY)	R-f stage plate circuit, band 5
T116		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; p/o Z216 (LISTED FOR REFERENCE ONLY)	R-f stage plate circuit, band 6
T117 thru T120		Not used	
T121		TRANSFORMER, RADIO FREQUENCY: mixer stage grid circuit; p/o Z221 (LISTED FOR REFERENCE ONLY)	Mixer stage grid coil, band 1
T122		TRANSFORMER, RADIO FREQUENCY: mixer stage grid circuit; p/o Z222 (LISTED FOR REFERENCE ONLY)	Mixer stage grid coil, band 2
T123		TRANSFORMER, RADIO FREQUENCY: mixer stage grid circuit; p/o Z223 (LISTED FOR REFERENCE ONLY)	Mixer stage grid coil, band 3
T124		TRANSFORMER, RADIO FREQUENCY: mixer stage grid circuit; p/o Z224 (LISTED FOR REFERENCE ONLY)	Mixer stage grid coil, band 4
T125		TRANSFORMER, RADIO FREQUENCY: mixer stage grid circuit; p/o Z225 (LISTED FOR REFERENCE ONLY)	Mixer stage grid coil, band 5
T126		TRANSFORMER, RADIO FREQUENCY: mixer stage grid circuit; p/o Z226 (LISTED FOR REFERENCE ONLY)	Mixer stage grid coil, band 6
T127 thru T130		Not used	
T131		TRANSFORMER, RADIO FREQUENCY: oscillator stage; band 1; p/o Z231 (LISTED FOR REFERENCE ONLY)	Oscillator coil, band 1
T132		TRANSFORMER, RADIO FREQUENCY: oscillator stage; band 2; p/o Z232 (LISTED FOR REFERENCE ONLY)	Oscillator coil, band 2
T133		TRANSFORMER, RADIO FREQUENCY: oscillator stage; band 3; p/o Z233 (LISTED FOR REFERENCE ONLY)	Oscillator coil, band 3
T134		TRANSFORMER, RADIO FREQUENCY: oscillator stage; band 4; p/o Z234 (LISTED FOR REFERENCE ONLY)	Oscillator coil, band 4
T135		TRANSFORMER, RADIO FREQUENCY: oscillator stage; band 5; p/o Z235 (LISTED FOR REFERENCE ONLY)	Oscillator coil, band 5
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
T136		TRANSFORMER, RADIO FREQUENCY: oscillator stage; band 6; p/o Z236 (LISTED FOR REFERENCE ONLY)	Oscillator coil, band 6
T137 thru T149		Not used	
T150		TRANSFORMER, RADIO FREQUENCY: 15 mc approximate peak frequency; 2 windings; primary 31 turns No. 30 "Quicksol" single nylon covered wire; secondary 2 turns No. 30 "Quicksol" single nylon covered wire; both windings close solenoid; 1.520 in. lg by 9/16 in. w by 7/16 in. thk; brass slug tuned; CADV No. 90837-1	Mixer output transformer
T151		TRANSFORMER, INTERMEDIATE FREQUENCY: 15 mc approximate peak frequency; input; unshielded; 1-5/16 in. max lg (with slug at max ccw position) by 19/32 in. dia; double tuned; brass slug tuning; CADV No. 90840-1	1st i-f transformer
T152		TRANSFORMER, INTERMEDIATE FREQUENCY: 15 mc approximate peak frequency; interstage; unshielded; 1-5/16 in. max lg (with slug at max ccw position) by 19/32 in. dia; double tuned; brass slug tuning; CADV No. 90850-1	2nd i-f transformer
T153		Same as T152	3rd i-f transformer
T154		TRANSFORMER, INTERMEDIATE FREQUENCY: 15 mc approximate peak frequency; interstage; unshielded; 1-5/16 in. max lg (with slug at max ccw position) by 19/32 in dia; double tuned; brass slug tuning; CADV No. 90948-1	4th i-f transformer
T155		TRANSFORMER, INTERMEDIATE FREQUENCY: 15 mc approximate peak frequency; interstage; unshielded; 1-5/16 in. max lg (with slug at max ccw position) by 19/32 in. dia; double tuned; brass slug tuning; CADV No. 90982-1	5th i-f transformer
T156		TRANSFORMER, INTERMEDIATE FREQUENCY: 15 mc approximate peak frequency; output; unshielded; 1-5/16 in. max lg (with slug at max ccw position) by 19/32 in. dia; double tuned; brass slug tuning; CADV No. 90860-1	I-f output transformer
T157		TRANSFORMER, AUDIO FREQUENCY: plate coupling type; Navy type (-304878); primary 10,000 ohms impedance; primary 5 ma dc; 1-1/4 in. square by 1-3/4 in. lg; max audio level 100 milliwatts; turns ratio of primary to 1/2 secondary 3.75 to 1; frequency response 100 to 3000 cycles ±2 db; electrostatic shield between primary and secondary; 4 solder lug terminals equi-distantly spaced on bottom of transformer; mts by two No. 6-32 by 1/4 in. dia inserts; CBGM No. 3875; CADV No. 10128	Pulse step-up transformer
T158		Same as T157	Audio output transformer
T159 thru T299		Not used	
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
V101		ELECTRON TUBE: MIL-E-1C type 5840; CADV No. 5840 (ND)	R-f amplifier
V102		Same as V101	R-f amplifier
V103		Same as V101	Mixer
V104		Same as V101	Mixer
V105		ELECTRON TUBE: JAN type 5718; CADV No. 5718 (ND)	Local oscillator
V106		ELECTRON TUBE: JAN type 6BH6; CADV No. 6BH6 (ND)	1st i-f amplifier
V107		Same as V106	2nd i-f amplifier
V108		Same as V106	3rd i-f amplifier
V109		Same as V106	4th i-f amplifier
V110		ELECTRON TUBE: JAN type 6005; CADV No. 6005 (ND)	5th i-f amplifier
V111		ELECTRON TUBE: JAN type 5726; CADV No. 5726 (ND)	Second detector
V112		ELECTRON TUBE: JAN type 6C4; CADV No. 6C4 (ND)	Beat frequency oscillator
V113		ELECTRON TUBE: JAN type 6AU6WA; CADV No. 6AU6WA (ND)	Video amplifier
V114		Same as V112	Audio output
V115		Same as V106	Pulse amplifier
V116		ELECTRON TUBE: JAN type 5814A; CADV No. 5814A (ND)	Trigger circuit
V117		Same as V106	Pulse amplifier
V118		Not used	
V119		Same as V112	VTVM
V120		Same as V112	VTVM
V121		Same as V116	Multivibrator circuit
V122		ELECTRON TUBE: JAN type OA2WA; CADV No. OA2WA (ND)	Voltage regulator
V123 thru V299		Not used	
W101		CABLE ASSEMBLY, RADIO FREQUENCY: r-f transmission line; consists of RG-58A/U cable, with P101 one end, P110 other end; 18 in. lg overall, including terminations; CADV No. 90973-1	Connects r-f input to turret attenuator
W102		CABLE ASSEMBLY, RADIO FREQUENCY: r-f transmission line; consists of RG-58A/U cable, with P105 one end, P106 other end; 6 in. lg overall, including terminations; CADV No. 90973-2	Connect coaxial switch to impulse noise generator
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
W103		CABLE ASSEMBLY, RADIO FREQUENCY: r-f transmission line; consists of RG-58A/U cable with P102 one end, P107 other end; 17 in. lg overall including terminations; CADV No. 91035-1	Connects low pass filter to coaxial switch
XI101		LAMPHOLDER: bayonet; for indicator light; CSE-708; CADV No. 10785	Holds dial light
XI102		SOCKET ASSEMBLY, NEON INDICATOR LAMP: one inch clear plastic lens; stovepipe type; inside matted; for NE-48 neon lamp; overall length 2-7/16 in., max dia 1-3/8 in.; 1 in. — 27 thread; with nut and lockwasher for mtg; requires one-inch mtg hole; two solder lug terminals rear of unit; CAYZ-80206-947; CADV No. 10488 (ND)	Socket assembly I102
XV101		SOCKET, ELECTRON TUBE: subminiature; 8 pins; round base; p/o Z108; CMG No. 54A17647; CADV No. 10629 (ND)	Socket for V101
XV102		Same as XV101	Tube socket for V102
XV103		Same as XV101 (p/o Z109)	Socket for V103
XV104		Same as XV101 (p/o Z109)	Socket for V104
XV105		Same as XV101 (p/o Z110)	Socket for V105
XV106		SOCKET, ELECTRON TUBE: JAN SO10C; 7 contacts; miniature; one piece saddle mtg; sub-chassis; two 1/8 in. dia mtg holes on 7/8 in. mtg/C; 5/8 in. dia chassis cutout required; round ceramic body 1-3/32 in. lg by 13/16 in. dia; phosphor bronze cad plated contacts; no markings; steel shield 3/32 in. dia; spec JAN-S-28; CEB No. 7676; CADV No. 10118 (ND)	Socket for V106
XV107		Same as XV106	Socket for V107
XV108		Same as XV106	Socket for V108
XV109		Same as XV106	Socket for V109
XV110		Same as XV106	Socket for V110
XV111		Same as XV106	Socket for V111
XV112		Same as XV106	Socket for V112
XV113		Same as XV106	Socket for V113
XV114		Same as XV106	Socket for V114
XV115		Same as XV106	Socket for V115
XV116		SOCKET, ELECTRON TUBE: 9 pin miniature; JAN type TSE9T102; one piece saddle mtg, sub-chassis; two 1/8 in. dia mtg holes on 1-1/8 in. mtc/C; 3/4 in. dia chassis cutout required; round ceramic body; 1-3/16 in. by 15/16 in. dia overall; beryllium copper silver plated contacts; spec JAN-S-28; CMG No. 53F13381; CADV No. 10036	Socket for V116
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
XV117		Same as XV106	Socket for V117
XV118		Not used	
XV119		Same as XV106	Socket for V119
XV120		Same as XV106	Socket for V120
XV121		Same as XV116	Socket for V121
XV122		Same as XV106	Socket for V122
XV123 thru XV299		Not used	
Y101		CRYSTAL UNIT, QUARTZ: 15 magacycles; fundamental type; CR-7 type holder; spec MS-91378; two radial wire leads; mfd by Precision Crystal Co.; CADV No. 10690	BFO crystal oscillator
Z101		CHOKE, RADIO FREQUENCY: 15 mc; self resonant; consists of 200 mf ceramic capacitor wound with approximately 15 turns of No. 25 enameled copper wire; CADV No. 90839-1	Filament filter V106
Z102		Same as Z101	Filament filter V107
Z103		Same as Z101	Filament filter V108
Z104		Same as Z101	Filament filter V109
Z105		Same as Z101	Filament filter V110-V111
Z106		CHOKE, RADIO FREQUENCY: 15 mc; self-resonant; consists of 22 mf ceramic capacitor wound with approximately 53 turns of No. 34 enameled copper wires; CADV No. 90947-1	BFO plate filter V112
Z107		GENERATOR, IMPULSE NOISE: 8 to 20 cycles-per-second; frequency range 0 to 4000 megacycles; one band (broadband) output voltage flat per unit bandwidth to approx 4000 mc; used with multivibrator trigger type oscillator; noise pulse output 0.00009 microsecond; output impedance 50 ohms; overall length 3 in.; round body portion 1-5/8 in. dia by 1-1/2 in. lg; mounting plate 1-3/4 in. square mtd 3/4 in. from one end; four No. 22 holes, one at ea corner, in mtg plate for screw mtg; type "N" coaxial connector one end extending 9/16 in. from round body portion; 3/8-32 NEF threaded portion extends 9/16 in. from opposite end; two 3/8-32 locknuts; terminates in feedthru capacitor; CADV No. 90857-1	Impulse noise generator

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
Z108		SUBASSEMBLY: includes mounting plate, tube sockets XV101, XV102, printed circuits, R101, R102, R103, R104, R105, R106, R107, R109, C110, C111, C112, C113, C114, C127, L101; CADV No. 90847-1 (ND)	R-f stage
Z109		SUBASSEMBLY: includes mounting plate, printed circuits, tube sockets XV103, XV104, and R111, R112, R113, R114, R125, C138, C139, C140, C141, C146, C147, C148, C176, L102, T150; CADV No. 90848-1 (ND)	Mixer stage
Z110		SUBASSEMBLY: includes mounting plate, printed circuits, tube socket XV105, R115, R124, C159, C160, C174, C175, L103; CADV No. 90849-1 (ND)	Oscillator stage
Z111		SUBASSEMBLY: includes printed link circuit and two contact clips on ea end; CADV No. 90992-1	R-f mixer coupling link
Z112		SUBASSEMBLY: antenna circuit; includes RF-58A/U cable, P102, printed circuit, mtg plates, and coil contact clips; CADV No. 90894-1 (ND)	Antenna input
Z113		ATTENUATOR, RADIO FREQUENCY: consists of attenuator pads E136, E137, E138, E139, E140, and E141, connector J102 and switch S101 and miscellaneous structural components; CADV No. 90802-1	R-f attenuator
Z114		ISOLATING CAPACITOR ASSEMBLY: frequency range 20 to 400 mc; 50 ohms impedance; consists of series-connected tubular ceramic capacitor 15,000 mmf, 1000 v dc peak; brass body, satin chrome plated; has one in. square by 1/4 in. mtg flange 21/32 in. from one end for panel mtg; overall dim. 3 in. lg by 5/8 in. dia exclusive of mtg flange; has special 50-ohm type "N" female connector ea end; end nearest mtg flange used as J101 RF INPUT receptacle; CADV No. 91232-1	R-f input isolating capacitor and r-f input connector
Z115		FILTER, LOW PASS: 470 mc design cut-off frequency; 50 ohms input and output impedance; two UG-625/U connectors, one at input and one at output ends; overall dim. 10-1/2 in. lg by 2-1/4 in. w by 7/8 in. h; cased; brass, silver plated; mounts by three screws; CADV No. 91033-1	Attenuates signals above cut-off frequency
Z201		TRANSFORMER, RADIO FREQUENCY: antenna stage; consists of T101, C101 antenna coil printed circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90841-1 (ND)	Antenna coil, band 1
Z202		TRANSFORMER, RADIO FREQUENCY: antenna stage; consists of T102, C102, antenna coil printed circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90842-1 (ND)	Antenna coil, band 2

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
Z203		TRANSFORMER, RADIO FREQUENCY; antenna stage; consists of T103, C103, antenna coil printed circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug and miscellaneous hardware; CADV No. 90843-1 (ND)	Antenna coil, band 3
Z204		TRANSFORMER, RADIO FREQUENCY: antenna stage; consists of T104, C104, antenna coil printed circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug and miscellaneous hardware; CADV No. 90844-1 (ND)	Antenna coil, band 4
Z205		TRANSFORMER, RADIO FREQUENCY: antenna stage; consists of T105, C105 antenna coil printed circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90845-1	Antenna coil, band 5
Z206		TRANSFORMER, RADIO FREQUENCY: antenna stage; consists of T106, C106, antenna coil printed circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90846-1	Antenna coil, band 6
Z207 thru Z210		Not used	
Z211		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; consists of T111, C121, r-f stage plate circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor and adjusting slug, and miscellaneous hardware; CADV No. 90851-1 (ND)	R-f stage plate circuit coil, band 1
Z212		TRANSFORMER, RADIO FREQUENCY; r-f stage plate circuit; consists of T112, C122, r-f stage plate circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90852-1 (ND)	R-f stage plate circuit coil, band 2
Z213		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; consists of T113, C123, r-f stage plate circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90853-1 (ND)	R-f stage plate circuit coil, band 3
Z214		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; consists of T114, C124, r-f stage plate circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90854-1 (ND)	R-f stage plate circuit coil, band 4

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
Z215		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; consists of T115, C125, R116, r-f stage plate circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90855-1	R-f stage plate circuit coil, band 5
Z216		TRANSFORMER, RADIO FREQUENCY: r-f stage plate circuit; consists of T116, C126, R117, r-f stage plate circuit eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90856-1	R-f stage plate circuit coil, band 6
Z217 thru Z220		Not used	
Z221		TRANSFORMER, RADIO FREQUENCY: grid circuit, mixer stage; consists of T121, C131, grid circuit mixer stage eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting slug, and miscellaneous hardware; CADV No. 90861-1 (ND)	Mixer stage grid coil, band 1
Z222		TRANSFORMER, RADIO FREQUENCY: grid circuit, mixer stage; consists of T122, C132, grid circuit mixer stage eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90862-1 (ND)	Mixer stage grid coil, band 2
Z223		TRANSFORMER, RADIO FREQUENCY; grid circuit, mixer stage; consists of T123, C133, grid circuit mixer stage eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90863-1 (ND)	Mixer stage grid coil, band 3
Z224		TRANSFORMER, RADIO FREQUENCY: grid circuit, mixer stage; consists of T124, C134, grid circuit mixer stage eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90864-1 (ND)	Mixer stage grid coil, band 4
Z225		TRANSFORMER, RADIO FREQUENCY: grid circuit, mixer stage; consists of T125, C135, grid circuit mixer stage eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90865-1	Mixer stage grid coil, band 5
Z226		TRANSFORMER, RADIO FREQUENCY: grid circuit mixer stage; consists of T126, C136, grid circuit mixer stage eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90866-1	Mixer stage grid coil, band 5
Z227 thru Z230		Not used	
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
Z231		TRANSFORMER, RADIO FREQUENCY: oscillator stage; consists of T131, C151, C161, oscillator eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90871-1 (ND)	Oscillator coil, band 1
Z232		TRANSFORMER, RADIO FREQUENCY: oscillator stage; consists of T132, C152, C162, oscillator eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90872-1 (ND)	Oscillator coil, band 2
Z233		TRANSFORMER, RADIO FREQUENCY: oscillator stage; consists of T133, C153, C163, oscillator eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90873-1 (ND)	Oscillator coil, band 3
Z234		TRANSFORMER, RADIO FREQUENCY: oscillator stage; consists of T134, C164, C154, oscillator eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90874-1 (ND)	Oscillator coil, band 4
Z235		TRANSFORMER, RADIO FREQUENCY: oscillator stage; consists of T135, C155, C165, R118, oscillator eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90875-1	Oscillator coil, band 5
Z236		TRANSFORMER, RADIO FREQUENCY: oscillator stage; consists of T136, C156, C166, R119, oscillator eyelet assembly, right and left-hand coil mtg blocks, trimmer capacitor adjusting screw, coil inductance adjusting slug, and miscellaneous hardware; CADV No. 90876-1	Oscillator coil, band 6
Z237 thru Z299		Not used	
300-399		POWER SUPPLY: PP-906A/URM-47A designated to operate from single phase source; 105 to 125 v ac, 210 to 250 v ac at 50 to 60 or 400 cps; provides regulated 225 v dc at 120 ma; −105 v dc regulated; 6.3 v ac at 4.35 amp; regulation accomplished by an electromagnetic servo system; p/o RI-FI Meter AN/URM-47A; CADV No. 91226-2 (ND)	
C300		Not used	
C301		CAPACITOR, FIXED, PAPER DIELECTRIC: 250,000 mmf 1 amp, 115 v ac; feedthru type, metal case; hermetically sealed; overall dim., 2 in. lg approx by 1 in. w approx by 5/8 in. OD approx; incl 1 in. sq center mtg bracket, with four 1/8 in. dia holes 3/4 in. C to C; solder lug type terminals; CD No. NFT-420; CADV No. 11162 (ND)	Regulator input filter

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
C302		Same as C301	Regulator input filter
C303		CAPACITOR, FIXED, PAPER DIELECTRIC; 15,000 mmf; ±20% tolerance; 400 vdcw; feedthru type, metal case; hermetically sealed; incl mtg bracket centrally located; 3/4 in. sq with four 0.144 in. dia holes spaced 1/2 in. C to C; overall dim., 1-5/8 in. lg by 13/32 in. dia, incl terminals; solder lug type terminals; CD No. NFT-104 CADV No. 11168 (ND)	Regulator input filter
C304		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 20,000 mmf; 450 vdcw; G.M.V. tolerance disc type; overall dim., 0.593 in. max dia by 0.160 in. thk; colored red; marked "ER" and ".02" two radial wire leads; CER type 817; CADV No. 10493 (ND)	A-c coupling for regulating solenoid
C305		CAPACITOR, FIXED, ELECTROLYTIC: two sections, 70-70 mfd; −10% +250% tolerance; 300 vdcw; stud mtg; MIL-C-62 type CE 42B700N; CD No. 42B700N; CADV No. 11008 (ND)	B+ filter
C306		Same as C305	B+ filter
C307		CAPACITOR, FIXED, ELECTROLYTIC: single section; 300 mfd; 150 v dc −20°C + 85°C oper temp range; 4-3/8 in. lg by 1-3/8 in. dia; hermetically sealed; solder lug terminals; MIL-C-62; spec type CE41B301J; CSF No. D16590; CADV No. 10273 (ND)	C− filter
C308		Same as C304	C− filter
C309		CAPACITOR, FIXED, PAPER DIELECTRIC: single section 1.0 mfd; +10%; 600 vdcw; hermetically sealed; bracket mtg; spec MIL-C-25; type CP69BIDF105K; CD No. CP69BIDF105K; CADV No. 10499 (ND)	Power factor stabilizer
C310		CAPACITOR, FIXED, PAPER DIELECTRIC: 500,000 mfd; 600 v dc; metal case; spec MIL-C-25; type CP53BIF504X; CD No. DYR6050J; CADV No. 10021 (ND)	Contact filter
C311		CAPACITOR, FIXED PAPER DIELECTRIC: 1.4 mfd; +20% tolerance; 60 vdcw; bathtub case; oil filled; hermetically sealed; overall dim., 2-1/2 in. lg by 1 in. w by 1-1/8 in. h; mtg feet integral with case; CD No. GMYR102; CADV No. 11170 (ND)	Regulator input
C312 thru C399		Not used	
CR301		SEMICONDUCTOR DEVICE, DIODE: 500 mills; 280 v; CBGB type 500; CADV No. 11167 (ND)	B+ supply rectifier
CR302		Same as CR301	C− supply rectifier
CR303		Same as CR301	B+ supply rectifier

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
CR304		Same as CR301	B+ supply rectifier
CR305		Same as CR301	B+ supply rectifier
CR306 thru CR399		Not used	
E300		Not used	
E301		SHIELD, ELECTRON TUBE: brass nickel plated; 2-1/4 in. lg by 0.810 in. dia ID by 0.914 in dia OD; internal tension spring for retaining tube in socket; open top; bayonet type mtg; used with 7 pin miniature tube socket; spec JAN-S-28; type TS102U03; CEB No. 9702-11; CADV No. 10039 (ND)	V301 tube shield
E302		COVER, ELECTRICAL CONNECTOR: aluminum; sandblasted finish; round shape; 1-9/16 in. dia by 5/8 in. max thk; incl chain 3-1/8 in. lg; CPH No. 9760-22; CADV No. 10157 (ND)	Cap and chain for J303
E303		POST, BINDING: push type; 15/16 in. lg by 1/2 in. dia overall dim., no mtg stud; 0.164 in. dia hole by 3/16 in. dia 8-32 thread; brass, nickel plated; 1/8 in. by 5/32 in. wire hole; adjustable; max opening 5/32 in. locating hole; CEB No. 6604; CADV No. 10171 (ND)	Ground connection
E304 thru E399		Not used	
F301		FUSE CARTRIDGE: 2 amp; 250 v; instantaneous; ferrule type; 1-1/4 in. lg by 1/4 in. dia; glass body; one time; CLF No. 312002; CADV No. 10411 (ND)	A-c line fuse
F302		Same as F301	A-c line fuse
F303		Same as F301	Spare fuse
F304		Same as F301	Spare fuse
F305 thru F399		Not used	
H301		GASKET: rectangular; one hole; 5-3/4 in. w by 10-1/16 in. lg by 1/32 in. thk; CADV No. 20054	Front panel gasket
H302		GASKET: neoprene; 9/16 in. OD by 5/16 in. dia center hole; 1/8 in. thk; CADV No. 20825	Fuse holder gasket
H303		Same as H302	Fuse holder gasket
H304		Same as H302	Fuse holder gasket

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
H305		Same as H302	Fuse holder gasket
H306		BOOT, DUST AND MOISTURE SEAL: incl mtg nut, hex shape 3/4 in. across flats 15/32-32 thread; black silicone "O" ring and sleeve; CAOR No. H-1267; CADV No. 70084	Toggle switch seal
H307		GASKET: metalastic material; 1-5/8 in. square by 0.020 in. thk; four 1/8 in. dia holes, two 1/16 in. dia holes; CADV No. 20062	J303 connector gasket
H308		GASKET: metalastic material; 1-3/16 in. square by 0.020 in. thk; four 1/8 in. dia holes, one 7/8 in. dia center hole; CADV No. 20063	J301 connector gasket
H309		Same as H308	J302 connector gasket
H310 thru H399		Not used	
I301		LAMP, INCANDESCENT: 6-8 v; 0.15 amp; T-3-1/4 type bulb; clear glass; bayonet base; 1-3/16 in. lg; brown bead; GE No. 47; CADV No. 10051 (ND)	Power supply "ON" indicator
J301		CONNECTOR, RECEPTACLE, ELECTRICAL: 5 contacts, 5 female connector mating ends; arc resistant plastic; straight shape; overall dim., 21/32 in. lg by 1-3/16 in. w by 1-3/16 in. h; inclosing shell; aluminum base alloy; resistant to corrosion; polarized; locking type; 7/8-20 thread on shell; with flange 9/16 in. from one end; 4 mtg holes on flange 13/32 in. C to C; CA No. CA3102E-14S-5S-(105A); CADV No. 11179 (ND)	Output connector
J302		CONNECTOR, RECEPTACLE, ELECTRICAL: 3 contacts; 3 male connector mating ends; arc resistant plastic; straight shape; overall dim. 31/32 in. lg by 1-3/16 in. w by 1-3/16 in. h; enclosing shell; aluminum base alloy; resistant to corrosion; polarized; locking type; 7/8-20 thread on shell; with flange 9/16 in. frame one end; 4 mtg holes on flange 13/32 in. C to C; CA No. CA3102E-14S-7P (105A); CADV No. 11180 (ND)	A-c line input connector
J303		CONNECTOR, RECEPTACLE, ELECTRICAL: 2 rectangular female contacts; polarized; straight; 1-5/8 in. lg by 1-5/8 in. w by 9/16 in. h; overall dim., cylindrical aluminum body, anodized finish; bakelite insert; mts by four 0.120 in. dia holes on 1-1/4 in. mtg centers; 1-3/8-18 thread on shell; Navy type — 49435; CPH No. 97-4085; CADV No. 10156 (ND)	Recorder power connector
J304 thru J399		Not used	

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
K301		RELAY, ARMATURE: electro-mechanical type regulator, 10 normally closed contacts; 10 ma d-c operating current; 8500 ohms resistance of coil; incl temp compensating resistor CBOE No. type VT110 No. 9518-1; CADV No. 11165 (ND)	Regulator
K302 thru K399		Not used	
L301		CHOKE, RADIO FREQUENCY: 100 uh; single winding; unshielded; 33 turns No. 24 wire; 0.08 ohm d-c resistance; 1 in. lg by 11/32 in. dia overall dim., coil wound on iron core; 2 axial wire leads; CADV No. 90292-1	Regulator input filter
L302		Not used	
L303		CHOKE, RADIO FREQUENCY: 1 amp current rating; 4 mh, 60 cps, encapsulated; overall dim., excluding terminals, 1-1/8 in. lg by 7/8 in. w by 1-1/4 in. h; MIL-T-27A type TF 2RX04ZZ; CAWC No. 11188 CADV No. 11188	Regulator input filter
L304 thru L399		Not used	
R301		RESISTOR, FIXED, WIREWOUND: non-inductive winding; 56 ohms; +3% tol, 25 watts; 1-1/16 in. lg by 1-3/32 in. w by 9/16 in. h; silicone sealed; resistant to salt water immersion; radiator finned; mounts on sub-panel with two 0.120 in. dia holes; COM type RH-25; CADV No. 11173 (ND)	Regulator shunt
R302		RESISTOR, FIXED, WIREWOUND: 7.1 ohms 11 watts; spec MIL-R-26; type RW29V7RI; COM No. RW29V7RI; CADV No. 11157-7RI (ND)	Regulator shunt
R303		RESISTOR, FIXED, WIREWOUND: 25 ohms; 11 watts; spec MIL-R-26; type RW29V250; COM No. RW29V250; CADV No. 11157-250 (ND)	Regulator shunt
R304		RESISTOR, FIXED, WIREWOUND: 50 ohms; 11 watts; spec MIL-R-26; type RW29V500; COM No. RW29V500; CADV No. 11157-500 (ND)	Regulator shunt
R305		RESISTOR, FIXED, WIREWOUND: 71 ohms; 11 watts; spec MIL-R-26; type RW29V710; COM No. RW29V710; CADV No. 11157-710 (ND)	Regulator shunt
R306		RESISTOR, FIXED, WIREWOUND: 120 ohms; 11 watts; spec MIL-R-26; type RW29V121; COM No. RW29V121; CADV No. 11157-121 (ND)	Regulator shunt
R307		RESISTOR, FIXED, WIREWOUND: 160 ohms; 11 watts; spec MIL-R-26; type RW29V161; COM No. RW29V161; CADV No. 11157-161 (ND)	Regulator shunt
R308		RESISTOR, FIXED, WIREWOUND: 250 ohms; 11 watts; spec MIL-R-26; type RW29V251; COM No. RW29V251; CADV No. 11157-251 (ND)	Regulator shunt

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
R309		RESISTOR, FIXED, WIREWOUND: 310 ohms; 11 watts; spec MIL-R-26; type RW29V311; COM No. RW29V311; CADV No. 11157-311 (ND)	Regulator shunt
R310		RESISTOR, FIXED, WIREWOUND: 350 ohms; 11 watts; spec MIL-R-26; type RW29V351; COM No. RW29V351; CADV No. 11157-351 (ND)	Regulator shunt
R311		RESISTOR, FIXED, WIREWOUND: 6800 ohms ±5%; 3 watts; 15/64 in. dia by 9/16 in. lg; vitreous enamel coated; axial wire leads; CSF type 151E; CADV No. 11166-682 (ND)	Solenoid current limiting
R312		Not used	
R313		RESISTOR, VARIABLE: wirewound element; 1 section; 15,000 ohms ±5%; 3 watts; phenolic body; metal case; enclosed; overall dim., 13/16 in. lg by 1-23/32 in. dia; single shaft, slotted, 1/4 in. dia by 5/64 in. lg; bushing mtd, 3/8-32 thd, 1/2 in. lg; CMC No. 58C2-15K; CADV No. 11171 (ND)	Regulated output adjust
R314		RESISTOR, FIXED, WIREWOUND: 50 ohms ±10%; 3 watts; 15/64 in. dia by 9/16 in. lg; vitreous enamel coated; axial wire leads; CSF type 151E; CADV No. 11166-500 (ND)	400 cycle comp. adjust
R315		RESISTOR, FIXED, COMPOSITION: 240 ohms ±5%; 2 watts; spec MIL-R-11; type RC42GF241J; CBZ No. EB-2415; CADV No. 10377-241 (ND)	Gaseous regulator current limiting
R316		RESISTOR, FIXED, COMPOSITION: 10 ohms ±5%; 1/2 watt; spec MIL-R-11; type RC20GF100J; CBZ No. EB-1005; CADV No. 10011-100 (ND)	Peak limiting for C310
R317 thru R399		Not used	
S301		SWITCH, TOGGLE: DPST; 2 positions; 1 amp, 250 v; 3 amp, 125 v; ac-dc; overall dim. excl terminals, bushing and handle, 1-9/16 in. lg by 21/32 in. w by 15/32 in. h; bat type lever, 13/16 in. lg; solder lug terminals; bushing mtd 15/32-32 thd; incl 1 hex nut and 1 knurled nut; body is laminated phenolic sections; CHH No. 20902-AJ; CADV No. 11160 (ND)	Power on-off switch
S302		SWITCH, TOGGLE: DPDT; 2 positions; 1 amp, 250 v; 3 amp, 125 v; ac-dc; overall dim. excl terminals, bushing and handle, 1-9/16 in. lg by 21/32 in. w by 15/32 in. h; bat type lever, 13/16 in. lg; solder lug terminals; bushing mtd 13/32-32 thd; incl 1 hex nut and 1 knurled nut; body is laminated phenolic sections; CHH No. 20905 (Special); CADV No. 10172 (ND)	115-230 v selector switch

* (ND) No Stoddard drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
S303		Same as S301	400 cycle selector switch
S304 thru S399		Not used	
T301		TRANSFORMER POWER, STEP-DOWN AND STEP-UP: hermetically sealed; fully enclosed; metal case; primary winding 97.5 v, 50-400 cycles; secondary windings 430 v center tap, 150 ma; 125 v, 30 ma; 8 v, 4.5 amp; 7.5 v, 4.5 amp; 7 v, 4.5 amp; 6.5 v, 4.5 amp; 6 v, 4.5 amp; overall dim., excl terminals, 3-9/16 in. lg by 3-1/16 in. w by 4-7/8 in. h; CAWC No. 11186-1 CADV No. 11186-1	Plate and heater transformer
T302		TRANSFORMER POWER, ISOLATION: hermetically sealed; fully enclosed; metal case; primary windings 115 v, 50-400 cycles and 115 v, 50-400 cycles, secondary winding 115 v, 900 ma; overall dim., excl terminals, 3-9/16 in. lg by 3-1/16 in. w by 4-7/8 in. h; CAWC No. 11301; CADV No. 11172	Isolation transformer
T303 thru T399		Not used	
V301		ELECTRON TUBE: glass envelope; voltage regulator; JAN type OB2WA (ND)	C– regulator
V302 thru V399		Not used	
XF301		FUSE HOLDER: extractor post type; 250 v, 15 amp electrical rating; accommodates cartridge type fuse, 1-1/4 in. lg by 1/4 in. dia; 1/2-16 thd body for panel hole mtg; 2 solder lug terminals one on end; one on side; CLF No. 342003; CADV No. 11161 (ND)	Fuse holder for F301
XF302		Same as XF301	Fuse holder for F302
XF303		Same as XF301	Spare fuse holder
XF304		Same as XF301	Spare fuse holder
XF305 thru XF399		Not used	
XI301		LIGHT, INDICATOR: with lens; 1/2 in. dia, red diamond-cut lens; for miniature bayonet base; CAYS-40; CADV No. 10115 (ND)	Pilot light socket
XI302 thru XI399		Not used	
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
XV301		SOCKET, ELECTRON TUBE: JAN-SO10C; 7 contacts; miniature; one piece saddle mtg; ceramic body 1-3/32 in. lg by 13/16 in. dia; spec JAN-S-28; CEB No. 7676; CADV No. 10118 (ND)	V103 tube socket
XV302 thru XV399		Not used	
Z301		FILTER, ASSEMBLY, ELECTRICAL: c/o four 1500 mmf feedthru capacitors; 2 coils c/o 10 turns No. 24 Formvar wound on two 10,000 ohm, 1 watt, resistors; enclosed in aluminum shield can, 1-3/4 in. lg by 1 in. w, by 25/32 in. h; 2 feedthru capacitor terminals each end, extends 7/16 in. beyond case; CADV No. 90386-1	Line noise filter
Z302		FILTER, ASSEMBLY, ELECTRICAL: B+ and C– supply filter; encapsulated choke coils; rectangular shape; 2-3/4 in. lg by 1-3/4 in. w by 3-3/16 in. h, overall dim.; terminals 1 and 2, 120 mh, 150 ma dc, 11.5 ohms; terminals 3 and 4, 1.5 hy, 150 ma dc, 43 ohms; terminals 5 and 6, 5 hy, 30 ma dc, 470 ohm; mtg by four studs 6-32 thd by 3/8 in. lg; CAWC No. 11187; CADV No. 11187	Terminals 1-2, B+ filter; terminals 3-4, B+ filter; terminals 5-6, C– filter
Z303 thru Z399		Not used	
400-499		ACCESSORIES	
A400		Not used	
A401		TRIPOD: Navy type (— 10545) for dipole antenna; collapsible type; 37-1/2 in. lg collapsed; 60 in. extended; wooden legs; aluminum head with aluminum socket for dipole mast; includes wing nut locking devices for legs; reversible legs, spike or rubber feet; CADV No. 90310-1	Dipole antenna support
A402		MAST SECTION: antenna; AN Mast Section AB-363/U; one piece construction; ash wood grade "A"; phenolic varnish finished; for tripod mtg; portable; no markings; principal parts consist of mast, connecting tube and rosan; provides support for dipole antenna head assembly; dia at base 27/32 in., dia at top 1 in., 36-1/8 in. h; CADV No. 90920-1	Dipole antenna support
A403		Same as A402	Dipole antenna support
A404		CASE, TEST SET: AN Case CY-1527( )/URM-47; carrying case for Radio Interference-Field Intensity Meter IM-88/URM-47; black fiber covered plywood; nickel plated brass corners; rectangular case 23-3/4 in. lg by 11-5/16 in. w by 13-1/4 in. h (with handle down); flock lined interior; carrying type case handle; nameplate marked with appropriate nomenclature and contract numbers; CADV No. 90922-1 (ND)	Meter unit carrying case
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
A405		CASE, ACCESSORIES: AN Case CY-1525 ( ) /URM-47; carrying case for Radio Interference-Field Intensity Meter AN/URM-47A accessories; black fiber covered plywood; nickel plated brass corners; rectangular case 15 in. lg by 13-7/8 in. lg by 10-3/8 in. w; (with handle down); flock lined interior; carrying type case handle; nameplate marked with appropriate nomenclature and contract number; CADV No. 90923-1 (ND)	Accessory case
A406		CASE, ANTENNA: AN Case CY-1526/URM-47; carrying case for Radio Interference-Field Intensity Meter AN/URM-47, AN/URM-47A antennas and tripods; black fiber covered plywood; nickel plated brass corners; rectangular case 41-1/4 in. lg by 14-5/16 in. h by 11-3/8 in. w (with handle down); flock lined interior; carrying type case handle; nameplate marked with appropriate nomenclature and contract number; CADV No. 90924-1 (ND)	Antenna and tripod case
A407		INDICATOR, AZIMUTH: used with Antenna Mast Section AB-363/U; aluminum, black lacquer finish; 3 in. lg by 2-1/4 in. dia; 1 in. hole through center; single knurled lock screw; longitudinal leaf tension spring riveted to inner wall; aluminum compass rose screwed to top by two No. 2-56 screw; compass rose calibrated 360 degrees, numbered at 10 degree intervals; two aluminum sighting pins 1/2 in. lg by 1/8 in. dia at 0 degree and 180 degree positions; CADV No. 90044-1	Indicator for dipole antenna orientation
A408		POINTER, AZIMUTH DIAL: used with Antenna Mast Section AB-363/U; aluminum; caustic dip finish; truncated cone shaped; max dia at base 2 in. tapering at 1-1/4 in. at top; 3/4 in. thk; two 8-32 set screws located 90 degrees apart; center hole 1.093 in. dia first 5/16 in. from bottom, 1.010 in. dia remainder of distance to top; marked with part number and black filled engraved indicator line; CADV No. 90045-1	Indicates orientation of dipole antenna
E400		Not used	
E401		ANTENNA, ASSEMBLY: AN Antenna Mast AB-371/U; high frequency; dipole head assembly, less elements; 88 to 400 mcs frequency range; 50 ohms characteristic input impedance; coaxial input; one dipole element may be inserted on ea side of head; tilting type; chrome alloy tubing; satin chrome plated; 35-7/8 in. lg by 7-27/32 in. max w; mts by one-inch dia 20 in. lg grade "A" ash wood mast (included); mounts on tripod A401; has balun slider and J401 connector; CADV No. 90833-1	High frequency dipole antenna

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
E402		ANTENNA ASSEMBLY: AN Antenna AT-477/U; low frequency; dipole head assembly, with elements; 20 to 88 mcs frequency range; 50 ohms characteristic input impedance; coaxial input; one dipole element may be inserted on ea side of head; 14 elements included (elements may also be used with E401 90833-1 Antenna Assembly); tilting type; mounts on tripod A401; phenolic and ash wood grade "A"; fungicidal varnish finished; mts by one-inch dia 20 in. lg mast (included); mts on tripod A401; has two variable inductances for adjusting resonant frequency; CADV No. 90832-1	Low frequency dipole antenna
E403		ANTENNA BASE: loop; AN Antenna Base AB-374/URM-47; has BNC connector top end (P414) type N connector (J406) 90 degrees away; both connectors located same end; 4-7/8 in. lg by 1-21/32 in. max w; supporting column 0.798 in. dia; aluminum, plain finish; CADV No. 90995-1	Loop antenna support
E404		CONNECTOR, ADAPTER: r-f plug; UG-349/U; CARO-No. 2975; CADV No. 10481 (ND)	Loop antenna adapter connector
E405		ANTENNA SECTION: whip type, used with AT-477/U low frequency dipole antenna assembly; chrome alloy steel tubing; satin chrome plate finish; 3 in. w, green identification band at center; one threaded and other end tapped for connecting to adjacent section; 23-1/2 in. lg by 3/8 in. dia tapering to 1/4 in. dia; CADV No. 50658	Dipole antenna element section
E406		Same as E405	Dipole antenna element section
E407		ANTENNA SECTION: whip type, used with AT-477/U low frequency dipole antenna assembly; chrome alloy steel tubing; satin chrome plate finish; 3 in. w, red identification band at center; one end threaded and other end tapped for connecting to adjacent section; 23-1/2 in. lg by 25/64 in. dia; CADV No. 50646	Dipole antenna element section
E408		Same as E407	Dipole antenna element section
E409		Same as E407	Dipole antenna element section
E410		Same as E407	Dipole antenna element section
E411		Same as E407	Dipole antenna element section
E412		Same as E407	Dipole antenna element section

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
E413		ANTENNA SECTION: whip type, used with AT-478/U, AT-477/U, and AB-364/U antenna assemblies; chrome alloy steel tubing; satin chrome plate finish; 3 in. w, yellow identification band at center; one end threaded and other end tapped for connecting to adjacent sections; 16-1/4 in. lg by 25/64 in. dia; CADV No. 50659	Dipole antenna element section (used with both high and low head)
E414		Same as E413	Dipole antenna element section
E415		ANTENNA SECTION: rod type; used with AT-477/U low frequency dipole antenna assembly and AT-478/U high frequency antenna assembly and AB-364/U vertical antenna base; chrome alloy, steel and brass, satin chrome plate finish; 3 in. w, white identification band at center; one end threaded for connecting to adjacent sections; other end telescopic construction; overall dim. 6-3/8 in. collapsed, 20-3/4 in. extended, max dia 11/32 in.; CADV No. 10724	Dipole antenna element section
E416		Same as E415	Dipole antenna element section
E417		ANTENNA SECTION: rod type; used with AT-477/U low frequency dipole antenna assembly and AB-364/U vertical antenna base; chrome alloy, steel and brass, satin chrome plate finish; 3 in. w, blue identification band at center; one end threaded for connecting to adjacent sections; other end telescopic construction; overall dim. 23-1/2 in. collapsed, 51-1/2 in. extended, max dia 1/4 in.; CADV No. 10725	Dipole antenna element section
E418		Same as E417	Dipole antenna element section
E419		ANTENNA BASE ASSEMBLY: AN Antenna base AB-364/U; vertical antenna; base plate 13 in. by 14-1/16 in.; max h at antenna mtg post located at center of plate 2-5/8 in.; base plate 52S-H34 1/2 hard aluminum; UG-58/U female connector; 24 round head 6-32 screws arranged circularly on top surface of base plate for attaching ground plane wires; also used as partition in A405 transit case; CADV No. 90929-1	Vertical antenna support
E420		ANTENNA: AN Antenna AT-426/U; used for radiation measurement; brass, 3/64 in. black rubber dipped coating over silver plating; one turn stranded wire, insulated, for loop winding; 3-1/8 in. OD by 6-7/8 in. lg; has E404; low impedance; CADV No. 90799-1	Loop antenna
E421		CLIP, BATTERY: steel, cad plated; jaw spread 3/8 in.; overall dim. 1-1/2 in. lg by 5/16 in. w; CBIT No. 45; CADV No. 10436 (ND)	R-f probe cable clip
E422		Same as E421	R-f probe cable clip

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
E423		CONNECTOR, R-F: UG-29A/U; female both ends (J407 and J408); CARO-UG-29B/U; CADV No. 10635 (ND)	Connects 20 ft r-f transmission line to r-f probe cable
E424		CONNECTOR ADAPTER, R-F: UG-27B/U; right angle adapter; CARO-UG-27B/U; CADV No. 10661	High frequency dipole antenna right angle adapter
H400		Not used	
H401		TAPE, MEASURING: AN Measuring Tape TL-635/U; steel; 12 ft lg extended; calibrated in mc; tape 3/8 in. w; steel; in steel case, black simulated leather covered; case dim., 3-3/32 in. dia by 9/16 in. thk excluding center portion; center portion (w/crank mechanism) 7/8 in. thk; marked with mfr name and part number; CADV No. 10611	Dipole measuring tape
H402		CLAMP, ELECTRICAL: AN type AN-3057-4; clamp for cable W406; aluminum; clear lacquer finish; 2 fillister head machine screws; 27/32 in. lg by 7/8 in. dia; accommodates cable up to 7/16 in. dia; CED 2255-2; CADV No. 10046 (ND)	Cable clamp
HT401		HEADSET, RADIO: Navy type (-49753); magnetic type; 600 ohms impedance; two receivers 2-1/16 in. dia by 15/16 in. d; one flat metal headband; CTE No. TH-37; alternate headset: HEADSET, RADIO: Navy type (-49507-A); magnetic type; 600 ohms impedance; two receivers 2-1/32 in. dia by 3/8 in. d; one flat plastic covered metal headband; CW No. D-173329; (both headsets GFE)	Auditory monitor
J400		Not used	
J401		CONNECTOR, RECEPTACLE: similar to type UG-58/U; special; p/o E401 (LISTED FOR REFERENCE ONLY)	High-frequency dipole antenna receptacle
J402		CONNECTOR, RECEPTACLE: type UG-58/U; CADV No. 10085 (ND)	Low-frequency dipole antenna receptacle
J403		CONNECTOR: female end of E406; type "N" (LISTED FOR REFERENCE ONLY)	High-frequency dipole antenna right angle adapter female end
J404		RECEPTACLE: loop antenna; cable, connecting end of E404; type "N" (LISTED FOR REFERENCE ONLY)	E404 cable connector
J405		RECEPTACLE: loop antenna; BNC type; E420 connector (LISTED FOR REFERENCE ONLY)	Loop antenna connector
J406		CONNECTOR, RECEPTACLE: type "N"; E403 cable connector (LISTED FOR REFERENCE ONLY)	Loop antenna mount cable connector

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
J407		CONNECTOR, RECEPTACLE: left end of E405; type "N" (LISTED FOR REFERENCE ONLY)	Cable connector E405
J408		CONNECTOR, RECEPTACLE: right end of E405; type "N" (LISTED FOR REFERENCE ONLY)	Cable connector E405
J409		Same as J402	Vertical antenna base connector
J410		Not used	
J411		CONNECTOR, RECEPTACLE: 3 round male contacts; polarized; straight; 0.656 in. OD by 29/32 in. lg less terminals; cylindrical aluminum body; tin plate finish; malamine insert; 11/16 in. mtg hole; mts by four 0.120 in. dia holes on 23/32 in. mtg/C; AN type dwg AN-3102-10SL-3P; CED No. 2054-3; CADV No. 10042 (ND)	Remote meter receptacle
L400		Not used	
L401		RESISTOR, VARIABLE, WIREWOUND: (used as variable inductor) 1 ohm ±10%; 2 watts; 40°C max continuous oper; 3 solder lug terminals; enclosed metal case 1-1/8 in. dia by 1-11/32 in. lg; round metal shaft 1/4 in. dia by 3/4 in. lg from mtg surface; linear taper; insulated contact arm; normal torque; bushing 3/8-32 by 1/4 in. lg; non-turn device located on 17/32 radius at 9 o'clock; CMC Series 43, type W mod; CADV No. 10249 (ND)	Dipole antenna series inductance
L402		RESISTOR, VARIABLE, WIREWOUND: (used as variable inductor) incl SPST switch; 1 ohm ±10%; 2 watts; 40°C max continuous oper; 3 solder lug terminals; enclosed metal case 1-1/8 in. dia by 3/4 in. lg from mtg surface; linear taper; insulated contact arm; normal torque; bushing mtg, 3/8 in. by 1/4 in. lg; non-turn device located on 17/32 in. radius at 9 o'clock; CMC Series 43, mod; CADV No. 10729 (ND)	Dipole antenna series inductance
M401		REMOTE METER ASSEMBLY: AN Voltmeter ME-76/U; d-c type; 0-1 ma; fan shaped meter; mtd on royalite plastic case; 45° sloping panel; color gray; portable type; 4-5/8 in. w by 4-3/4 in. h by 6-3/8 in. lg overall; accuracy ±1%; calibrated for non-magnetic panel; black numbers on white background; resistance of meter 1450 ohms ±10%; 26 scale divisions for 0-100 microvolt scale; 0-40 scale divisions for db scale; long lance-type pointer; self-contained; CADV No. 90934-1	Remote microvolt and db meter
P400		Not used	
P401		CONNECTOR, PLUG: AN Plug UG-21D/U; Navy spec RE-49F402; 1 male contact; straight type; 3/4 in. OD by 1-3/4 in. lg overall; coaxial, weatherproof; type "N"; CANS No. UG-21D/U; CADV No. 10701 (ND)	W401 connector
P402		Same as P401	W401 connector

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
P403		CONNECTOR, RECEPTACLE: AN type AN-3106-14S-7S; 3 round female contacts; polarized; straight; 1-1/8 in. dia by 1-21/32 in. lg overall; cylindrical aluminum body; tin plate finish; melamine insert; mts to cable; 7/8-20 coupling thread; 3/4-20 conduit thread; CADV No. 11136 (ND)	W403 connector
P404		CONNECTOR PLUG: 3 pin type; 2 flat contacts and one "U" shape contact; molded into and part of CADV No. 10944 (no part number - see W403) (LISTED FOR REFERENCE ONLY) (ND)	W403 connector
P405		CONNECTOR, PLUG: AN type UG-536/U; CADV No. 10478 (ND)	W402 connector
P406		CONNECTOR, PLUG: Navy type ( ) 5 round male contacts; polarized; straight; 0.906 in. OD by 1.073 in. lg overall; cylindrical body; aluminum; cad plated; knurled coupling nut 1.109 in. OD, 7/8-20 NEF-2 thd; polychloroprene insert; CED No. CA3106 F-14S-5P (A105); CADV No. 11177 (ND)	W407 connector
P407		CONNECTOR, RECEPTACLE: Navy type ( ); 5 round female contacts; polarized; straight; 7/8 in. OD by 21/64 in. lg; cylindrical; aluminum body; cad plated; standard polychloroprene insert; four 0.120 in. dia mtg holes; 29/32 in. mtg centers; 7/8-20 NEF-2 thd; CED No. 3106F-14S-5S (A105); CADV No. 11176 (ND)	W407 connector
P408		CONNECTOR, R-F: end of E404 which connects to transmission line (LISTED FOR REFERENCE ONLY)	Loop antenna cable connector
P409		CONNECTOR, PLUG: Navy type plug UG-260/U; Navy spec RE-49F-380; 1 male contact; straight type; 27/64 in. OD by 31/32 in. lg overall; coaxial; small "N" type constant impedance plug for W304; has bayonet coupling; CARD 3100; CADV No. 10228 (ND)	W404 connector
P410		PLUG, TELEPHONE: JAN type PJ-055B; 2 conductors; single shank; tubular; black, molded cellulose acetate shell; shank 1/4 in. dia by 1-7/32 in. lg; shell 1/2 in. dia; overall length 2-27/32 in. for lug or eyelet cable termination; CRL PJ-055B; CADV No. 10089 (ND)	W405 connector
P411		JACK, TELEPHONE: Navy type (-49929); for 2 conductor plug 0.25 in. dia; 11/16 in. dia by 3-3/8 in. lg overall; contact arrangement J1-1A; mts to cable W303; cable opening 0.250 in. dia; CMA No. 100A; CADV No. 10087	W405 connector
P412		PLUG, TELEPHONE: JAN type PJ-068; 3 cond; single shank; tubular black fiber shell; shank 13/64 in. dia by 1-3/32 in. lg; shell 1/2 in. dia; overall length 3-1/4 in. for lug or eyelet cable terminations; CRL-PJ-068B; CADV No. 10088 (ND)	W406 connector
		* (ND) No Stoddart drawing.	

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)			
P413		CONNECTOR, RECEPTACLE: 3 round female contacts; polarized; straight; 7/8 in. dia by 1-1/2 in. lg overall; cylindrical aluminum body, tin plate finish; melamine insert; mts to cable W406; 5/8-24 coupling and conduit thread; AN type AN-3106-10SL-3S; CED No. 2072-4; CADV No. 10069 (ND)	W406 connector
P414		CONNECTOR, R-F: BNC type similar to UG-260/U; not replaceable (LISTED FOR REFERENCE ONLY)	Loop antenna mounting connector
P415		MALE END OF E406: right angle adapter for high frequency dipole antenna (LISTED FOR REFERENCE ONLY)	High frequency dipole antenna right
R400		Not used	
R401		RESISTOR, FIXED, COMPOSITION: 37.9 to 38.5 ohms (to be read on resistance bridge) 1/2 watt; style RC20; MIL-R-11; CADV No. 10431 (ND)	Resistive balun
R402		RESISTOR, FIXED, COMPOSITION: 9.3 to 9.9 ohms (to be read on resistance bridge) 1/2 watt; style RC-20; MIL-R-11; CADV No. 10430 (ND)	Resistive balun E402
R403		RESISTOR, FIXED, COMPOSITION: 79 to 81 ohms (to be read on resistance bridge) 1/2 watt; style RC-20; MIL-R-11; CADV No. 10637 (ND)	Resistive balun E402
W400		Not used	
W401		CABLE ASSEMBLY, RADIO FREQUENCY: r-f transmission line; AN R-f Cable Assembly CG-92D/U (20 ft 0 in.); RG-8/U cable; 20 in. lg including terminations; has P401 one end, P402 other end; CADV No. 90933-1	R-f transmission line
W402		CABLE ASSEMBLY, RADIO FREQUENCY: r-f probe; RG-55/U cable; two CADV No. 10436 clips one end, one UG-536/U connector other end P405; 1 ft 6 in. lg; CADV No. 90757-1	R-f probe cable, CG-1064/U
W403		CABLE ASSEMBLY, POWER ELECTRICAL: AN type, CX-3810 ( ) /U (6 ft 6 in.) power type; 3 conductors; neoprene covered; has P403 on one end and P404 and adapter on other end; 6 ft 5-9/16 in. lg overall; CADV No. 91258-1	A-c power cable
W404		CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL: AN type CG-573/U (3 ft 0 in.); 3 ft lg excluding termination; has P409 one end; CADV No. 90071-1	Oscilloscope cable
W405		CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: AN type CG-572/U (20 ft 0 in.); RG-108/U cable; 20 ft lg excluding terminations; has P410 one end, P411 other end; CADV No. 90074-1	Headphone extension cable

* (ND) No Stoddart drawing.

TABLE 8-1. MAINTENANCE PARTS LIST (Cont'd)

Reference Desig	Notes	Name and Description	Locating Function
		RADIO INTERFERENCE MEASURING SET AN/URM-47A (Cont'd)	
W406		CABLE, ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: AN type CG-571/U (20 ft 0 in.); RG-108/U cable; 20 ft lg excluding terminations; has P413 and H402 one end, P412 opposite end; CADV No. 90075-2	Remote meter cable
W407		CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL: 10 ft 0 in. lg; cable c/o 5 conductors No. 16 AWG stranded; conductors made up of 19 strands of No. 29 AWG tinned copper; insulation of each conductor is extruded thermoplastic w/outer jacket of nylon; rated at 600 v ac rms; all conductors are enclosed in flexible shielding conduit; conduit is covered with thin wall of rubber; 10 ft lg overall dim.; has P406 one end and P407 on opposite end; CADV No. 91487-1	Power cable assembly

* (ND) No Stoddart drawing.

TABLE 8-2. STOCK NUMBER IDENTIFICATION

REF. DESIG.	FEDERAL STOCK NO.	DESIG. REF.	FEDERAL STOCK NO.	REF. DESIG.	FEDERAL STOCK NO.
100-299	N6625-643-3320	E116	N5960-264-3004	H307	N5330-584-1206
300-399	N6625-621-9037	E118	N5355-644-3875	H308	N5330-584-1207
A401	N6625-304-9252	E123	N5355-668-2282	H401	N5210-620-8636
A402	N5985-624-3252	E128	N5935-252-6340	H402	N5935-248-2375
A404	N6625-038-0880	E129	N5355-644-2185	I101	G6240-155-8706
A405	N6625-038-0878	E130	N5355-667-9763	I102	G6240-179-1812
A406	N6625-038-0879	E131	N5355-644-1615	J102	N5935-201-8153
A407	N6625-669-8780	E132	N5355-644-1007	J103	N5935-259-2030
A408	N5355-668-6516	E133	N5355-644-1983	J105	N5935-549-5863
CR101	N5960-262-0331	E134	N5355-644-1006	J106	N5935-549-7720
CR301	N5960-621-9017	E136	N6625-026-9421	J107	N5935-299-7815
C108	N5910-667-7177	E137	N6625-026-9273	J108	N5935-283-1269
C109	N5910-648-9081	E139	N5985-238-7837	J109	N5935-258-4413
C115	N5910-666-6679	E140	N5985-238-7840	J110	N5935-234-1597
C118	N5910-643-8875	E141	N5985-238-7841	J114	N5935-556-5958
C119	N5910-667-7187	E143	N5935-321-5084	J301	N5935-642-0764
C120	N5910-668-3645	E144	N5935-280-2219	J302	N5935-642-4901
C140	N5910-667-8828	E301	N5960-243-0693	J303	N5935-237-3964
C151	N5910-280-9270	E302	N5935-254-2251	J402	N5935-149-3483
C152	N5910-270-9119	E303	N5940-231-9496	J411	N5935-189-2962
C153	N5910-280-9271	E401	N6625-295-7100	K101	N5945-259-0996
C154	N5910-270-9125	E402	N5820-295-8556	K301	N6110-620-8451
C155	N5910-577-1480	E403	N5985-644-0209	L101	N5950-648-4876
C156	N5910-649-0105	E404	N5935-201-3091	L104	N5950-263-1701
C159	N5910-644-0519	E405	N5985-038-2418	L106	N5999-642-5951
C181	N5910-648-7841	E407	N5840-038-2421	L107	N5950-648-0066
C182	N5910-669-3130	E413	N6625-548-8779	L301	N5950-234-4348
C183	N5910-643-8778	E415	N6625-295-7093	L303	N5950-621-9014
C185	N5910-643-8890	E417	N5985-548-3815	L401	N5905-144-8466
C191	N5910-668-1254	E419	N5985-039-6037	L402	N5905-583-6549
C194	N5910-280-8370	E420	N5985-090-2622	M101	N6625-643-2911
C246	N5910-666-5185	E421	N5940-245-7221	M401	N6625-626-3442
C250	N5910-666-6236	E423	N5935-549-4151	N101	N6625-227-1466
C259	N5910-196-2571	E424	N5935-295-6287	O101	N5930-327-7017
C261	N5910-668-6442	F401	N5920-280-4960	O102	N6625-026-9768
C262	N5910-192-8418	HT401	N5965-128-8757	O109	N6625-528-8038
C264	N5910-666-6045	H109	N5120-293-2074	O116	N6625-613-3132
C267	N5910-649-0856	H110	N5935-665-4931	O117	N5355-519-4836
C281	N5910-643-8887	H113	N6625-525-6755	O118	N6625-519-0618
C301	N5910-621-9036	H118	N6625-567-5166	O119	N6625-528-8035
C303	N5910-621-9035	H121	N5310-268-6123	O120	N6625-528-8036
C304	N5910-583-4425	H126	N5330-231-6922	P101	N5935-295-5414
C305	N5910-583-4426	H127	N5330-231-6903	P103	N5935-528-4422
C307	N5910-195-3310	H128	N5330-231-6934	P104	N5935-295-3330
C309	N5910-188-1289	H129	N6625-620-8481	P109	N5935-257-7060
C310	N5910-187-5684	H130	N5330-599-2062	P401	N5935-258-4598
C311	N5910-621-9034	H135	N5120-198-5398	P403	N5935-283-3725
E101	N6625-307-7090	H136	N5120-224-2504	P405	N5935-149-3059
E103	N5960-548-9223	H137	N5120-242-7410	P406	N5935-283-3727
E106	N5960-272-9094	H301	N5330-235-4981	P407	N5935-636-6615
E110	N5960-296-4072	H302	N5330-584-1325	P409	N5935-258-7883
E111	N5960-262-0015	H306	N5975-548-8777	P410	N5935-192-4760

TABLE 8-2. STOCK NUMBER IDENTIFICATION (Cont'd)

REF. DESIG.	FEDERAL STOCK NO.	REF. DESIG.	FEDERAL STOCK NO.	REF. DESIG.	FEDERAL STOCK NO.
P411	N5935-254-7682	R233	N5905-279-8941	W403	N6625-621-9039
P412	N5935-192-4753	R238	N5905-254-7096	W404	N6625-187-9790
P413	N5935-196-2197	R239	N5905-192-3973	W405	N5995-188-0376
R101	N5905-279-3497	R245	N5905-190-8883	W406	N6625-188-0379
R102	N5905-107-7375	R301	N5905-577-2833	W407	N5995-557-8212
R103	N5905-258-8481	R302	N5905-577-1919	XF301	N5920-280-4167
R106	N5905-279-1880	R303	N5905-258-6919	XI101	N6250-256-1903
R107	N5905-279-1876	R304	N5905-583-6540	XI102	N6210-299-4325
R108	N5905-279-1757	R305	N5905-549-6874	XI301	N6210-299-4061
R109	N5905-195-6761	R306	N5905-642-1969	XV106	N5935-232-3758
R113	N5905-171-2000	R307	N5905-549-3752	XV116	N5935-222-9828
R115	N5905-195-6806	R308	N5905-549-5372	XV301	N5935-232-3758
R116	N5905-190-8889	R309	N5905-549-2589	Y101	N5955-518-4417
R120	N5905-185-8510	R310	N5905-549-2286	Z101	N5950-347-7620
R121	N5905-283-5821	R311	N5905-583-6542	Z106	N5915-296-0844
R123	N5905-201-6759	R313	N5905-583-6548	Z107	N6625-643-7860
R124	N5905-279-3505	R314	N5905-583-6541	Z108	N6625-519-0625
R125	N5905-171-1986	R315	N5905-279-1926	Z109	N6625-309-0466
R126	N5905-299-1541	R401	N5905-583-6547	Z110	N6625-310-6859
R127	N5905-279-2597	R402	N5905-583-6546	Z111	N6625-310-6860
R128	N5905-107-8047	R403	N5905-583-6545	Z112	N6625-313-7945
R129	N5905-279-3506	S101	N5985-093-7090	Z113	N5905-258-2998
R134	N5905-249-3661	S102	N5930-548-3424	Z114	N6625-613-2944
R137	N5905-295-3906	S103	N5930-296-9138	Z115	N5915-501-3593
R138	N5905-642-5338	S301	N5930-259-8403	Z201	N5950-648-0531
R142	N5905-299-2001	S302	N5930-251-2357	Z202	N5950-645-2931
R146	N5905-171-2006	T150	N5950-090-3944	Z203	N5950-645-2935
R147	N5905-254-9201	T151	N5950-090-3945	Z204	N5950-645-2934
R149	N5905-195-6800	T152	N5950-645-2285	Z205	N5950-645-2933
R150	N5905-279-3499	T154	N5950-090-3947	Z206	N5950-647-9346
R153	N5905-107-8041	T155	N5950-090-3948	Z211	N5950-648-0540
R163	N5905-279-3838	T156	N5950-284-5768	Z212	N5950-647-9340
R166	N5905-192-0390	T157	N5950-231-4458	Z213	N5950-647-9339
R177	N5905-279-3514	T301	N5950-621-9015	Z214	N5950-647-9344
R178	N5905-252-5434	T302	N5950-621-9011	Z215	N5950-645-2938
R180	N5905-279-1718	V101	N5960-230-5241	Z216	N5950-647-9345
R182	N5905-255-2429	V105	N5960-228-3793	Z221	N5950-648-0534
R183	N5905-171-1998	V106	N5960-188-3602	Z222	N5950-645-2936
R184	N5905-299-2005	V110	N5960-669-6861	Z-223	N5950-645-2941
R189	N5905-190-8865	V111	N5960-262-0185	Z224	N5950-645-2940
R190	N5905-279-2514	V112	N5960-188-8515	Z225	N5950-648-0529
R191	N5905-192-7343	V113	N5960-262-0132	Z226	N5950-647-9342
R192	N5905-279-2616	V116	N5960-262-0210	Z231	N5950-648-0541
R196	N5905-279-2515	V122	N5960-262-0964	Z232	N5950-648-0530
R204	N5905-299-2028	V301	N5960-262-3763	Z233	N5950-647-9347
R205	N5905-171-1999	W101	N6625-032-5679	Z234	N5950-647-9341
R211	N5905-272-6567	W102	N6625-519-4928	Z235	N5950-647-9343
R222	N5905-279-1883	W103	N6625-519-3273	Z236	N5950-647-9677
R224	N5905-279-3500	W401	N6625-039-5110	Z301	N5915-256-0025
R226	N5905-195-6791	W402	N6625-643-2736	Z302	N5950-621-9018
R229	N5905-279-2521				

TABLE 8-3. STOCK NUMBER CROSS REFERENCE

FEDERAL	REF. DESIG.	FEDERAL	REF. DESIG.	FEDERAL	REF. DESIG.
G6240-155-8706	I101	N5905-254-9201	R147	N5910-196-2571	C259
G6240-179-1812	I102	N5905-255-2429	R182	N5910-270-9119	C152
N5120-198-5398	H135	N5905-258-2998	Z113	N5910-270-9125	C154
N5120-224-2504	H136	N5905-258-6919	R303	N5910-280-8570	C194
N5120-242-7410	H137	N5905-258-8481	R103	N5910-280-9270	C151
N5120-293-2074	H109	N5905-272-6567	R211	N5910-280-9271	C153
N5210-620-8636	H401	N5905-279-1718	R180	N5910-577-1480	C155
N5310-268-6123	H121	N5905-279-1757	R108	N5910-583-4425	C304
N5330-231-6903	H127	N5905-279-1876	R107	N5910-583-4426	C305
N5330-231-6934	H128	N5905-279-1880	R106	N5910-621-9034	C311
N5330-235-4981	H301	N5905-279-1883	R222	N5910-621-9035	C303
N5330-584-1206	H307	N5905-279-1926	R315	N5910-621-9036	C301
N5330-584-1207	H308	N5905-279-2514	R190	N5910-643-8778	C183
N5330-584-1325	H302	N5905-279-2515	R196	N5910-643-8875	C118
N5330-599-2062	H130	N5905-279-2521	R229	N5910-643-8887	C281
N5350-231-6922	H126	N5905-279-2597	R127	N5910-643-8890	C185
N5355-519-4836	O117	N5905-279-2616	R192	N5910-644-0519	C159
N5355-644-1007	E132	N5905-279-3497	R101	N5910-648-7841	C181
N5355-644-1006	E134	N5905-279-3499	R150	N5910-648-9081	C109
N5355-644-1615	E131	N5905-279-3500	R224	N5910-649-0105	C156
N5355-644-1983	E133	N5905-279-3505	R124	N5910-649-0856	C267
N5355-644-2185	E129	N5905-279-3506	R129	N5910-666-5185	C246
N5355-644-3875	E118	N5905-279-3514	R177	N5910-666-6045	C264
N5355-667-9763	E130	N5905-279-3838	R163	N5910-666-6236	C250
N5355-668-2282	E123	N5905-279-8941	R233	N5910-666-6679	C115
N5355-668-6516	A408	N5905-283-5821	R121	N5910-667-7177	C108
N5820-295-8556	E402	N5905-295-3906	R137	N5910-667-7187	C119
N5840-038-2421	E407	N5905-299-1541	R126	N5910-667-8828	C140
N5905-107-7375	R102	N5905-299-2001	R142	N5910-668-1254	C191
N5905-107-8041	R153	N5905-299-2005	R184	N5910-668-3645	C120
N5905-107-8047	R128	N5905-299-2028	R204	N5910-668-6442	C261
N5905-144-8466	L401	N5905-549-2286	R310	N5910-669-3130	C182
N5905-171-1986	R125	N5905-549-2589	R309	N5915-256-0025	Z301
N5905-171-1998	R183	N5905-549-3752	R307	N5915-296-0844	Z106
N5905-171-1999	R205	N5905-549-5372	R308	N5915-501-3593	Z115
N5905-171-2000	R113	N5905-549-6874	R305	N5920-280-4167	XF301
N5905-171-2006	R146	N5905-577-1919	R302	N5920-280-4960	F301
N5905-185-8510	R120	N5905-577-2833	R301	N5930-251-2357	S302
N5905-190-8865	R189	N5905-583-6540	R304	N5930-259-8403	S301
N5905-190-8883	R245	N5905-583-6541	R314	N5930-296-9138	S103
N5905-190-8889	R116	N5905-583-6542	R311	N5930-327-7017	O101
N5905-192-0390	R166	N5905-583-6545	R403	N5930-548-3424	S102
N5905-192-3973	R239	N5905-583-6546	R402	N5935-149-3059	P405
N5905-192-7343	R191	N5905-583-6547	R401	N5935-149-3483	J402
N5905-195-6761	R109	N5905-583-6548	R313	N5935-189-2962	J411
N5905-195-6791	R226	N5905-583-6549	L402	N5935-192-4753	P412
N5905-195-6800	R149	N5905-642-1969	R306	N5935-192-4760	P410
N5905-195-6806	R115	N5905-642-5338	R138	N5935-196-2197	P413
N5905-201-6759	R123	N5910-187-5684	C310	N5935-201-3091	E404
N5905-249-3661	R134	N5910-188-1289	C309	N5935-201-8153	J102
N5905-252-5434	R178	N5910-192-8418	C262	N5935-222-9828	XV116
N5905-254-7096	R238	N5910-195-3310	C307	N5935-232-3758	XV106

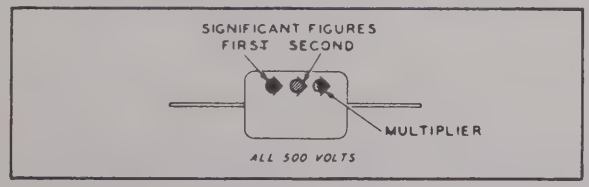
TABLE 8-3. STOCK NUMBER CROSS REFERENCE (Cont'd)

FEDERAL	REF. DESIG.	FEDERAL	REF. DESIG.	FEDERAL	REF. DESIG.
N5935-232-3758	XV301	N5950-645-2935	Z203	N5985-238-7841	E141
N5935-234-1597	J110	N5950-645-2936	Z222	N5985-548-3815	E417
N5935-237-3964	J303	N5950-645-2938	Z215	N5985-624-3252	A402
N5935-248-2375	H402	N5950-645-2940	Z224	N5985-644-0209	E403
N5935-252-6340	E128	N5950-645-2941	Z223	N5995-188-0376	W405
N5935-254-2251	E302	N5950-647-9339	Z213	N5995-557-8212	W407
N5935-254-7682	P411	N5950-647-9340	Z212	N5999-642-5951	L106
N5935-257-7060	P109	N5950-647-9341	Z234	N6110-620-8451	K301
N5935-258-4413	J109	N5950-647-9342	Z226	N6210-299-4061	XI301
N5935-258-4422	P103	N5950-647-9343	Z235	N6210-299-4325	XI102
N5935-258-4598	P401	N5950-647-9344	Z214	N6250-256-1903	XI101
N5935-258-7883	P409	N5950-647-9345	Z216	N6625-026-9273	E137
N5935-259-2030	J103	N5950-647-9346	Z206	N6625-026-9421	E136
N5935-280-2219	E144	N5950-647-9347	Z233	N6625-026-9768	O102
N5935-283-1269	J108	N5950-647-9677	Z236	N6625-032-5679	W101
N5935-283-3725	P403	N5950-648-0066	L107	N6625-038-0878	A405
N5935-283-3727	P406	N5950-648-0529	Z225	N6625-038-0879	A406
N5935-295-3330	P104	N5950-648-0530	Z232	N6625-038-0880	A404
N5935-295-5414	P101	N5950-648-0531	Z201	N6625-039-5110	W401
N5935-295-6287	E424	N5950-648-0534	Z221	N6625-187-9790	W404
N5935-299-7815	J107	N5950-648-0540	Z211	N6625-188-0379	W406
N5935-321-5084	E143	N5950-648-0541	Z231	N6625-227-1466	N101
N5935-549-4151	E423	N5950-648-4876	L101	N6625-295-7093	E415
N5935-549-5863	J105	N5955-518-4417	Y101	N6625-295-7100	E401
N5935-549-7720	J106	N5960-188-3602	V106	N6625-304-9252	A401
N5935-556-5958	J114	N5960-188-8515	V112	N6625-307-7090	E101
N5935-636-6615	P407	N5960-228-3793	V105	N6625-309-0466	Z109
N5935-642-0764	J301	N5960-230-5241	V101	N6625-310-6859	Z110
N5935-642-4901	J302	N5960-243-0693	E301	N6625-310-6860	Z111
N5935-665-4931	H110	N5960-262-0015	E111	N6625-313-7945	Z112
N5940-231-9496	E303	N5960-262-0132	V113	N6625-519-0618	O118
N5940-245-7221	E421	N5960-262-0185	V111	N6625-519-0625	Z108
N5945-259-0996	K101	N5960-262-0210	V116	N6625-519-3273	W103
N5950-090-3944	T150	N5960-262-0331	CR101	N6625-519-4928	W102
N5950-090-3945	T151	N5960-262-0964	V122	N6625-525-6755	H113
N5950-090-3947	T154	N5960-262-3763	V301	N6625-528-8035	O119
N5950-090-3948	T155	N5960-264-3004	E116	N6625-528-8036	O120
N5950-231-4458	T157	N5960-272-9094	E106	N6625-528-8038	O109
N5950-234-4348	L301	N5960-296-4072	E110	N6625-548-8779	E413
N5950-263-1701	L104	N5960-548-9223	E103	N6625-567-5166	H118
N5950-284-5768	T156	N5960-621-9017	CR301	N6625-613-2944	Z114
N5950-347-7620	Z101	N5960-669-6861	V110	N6625-613-3132	O116
N5950-621-9011	T302	N5965-128-8757	HT401	N6625-620-8481	H129
N5950-621-9014	L303	N5975-548-8777	H306	N6625-621-9037	300-399
N5950-621-9015	T301	N5985-038-2418	E405	N6625-621-9039	W403
N5950-621-9018	Z302	N5985-039-6037	E419	N6625-626-3442	M401
N5950-645-2285	T152	N5985-090-2622	E420	N6625-643-2736	W402
N5950-645-2931	Z202	N5985-093-7090	S101	N6625-643-2911	M101
N5950-645-2933	Z205	N5985-238-7837	E139	N6625-643-3320	100-299
N5950-645-2934	Z204	N5985-238-7840	E140	N6625-643-7860	Z107
				N6625-669-8780	A407

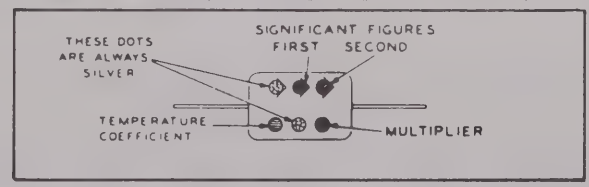
TABLE 8-4. APPLICABLE COLOR CODES AND MISCELLANEOUS DATA

CAPACITOR COLOR CODES

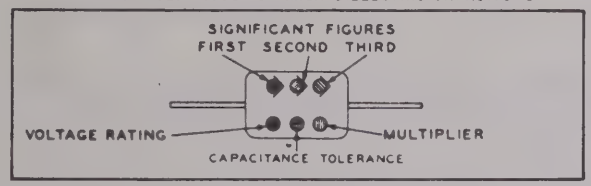
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



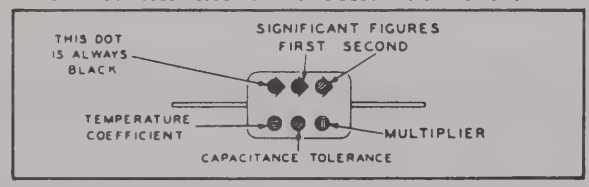
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



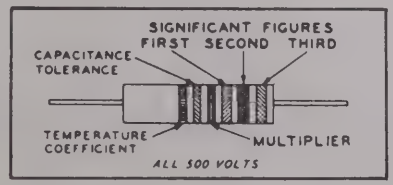
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

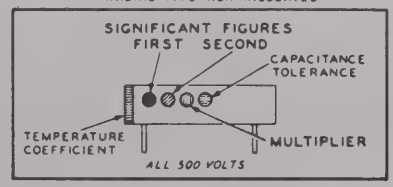


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

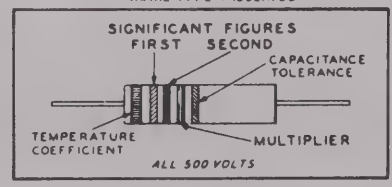


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



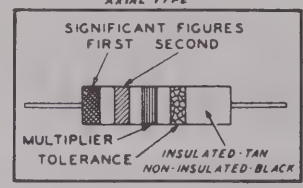
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS		CAPACITORS						
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1000,000			600	G
	10,000,000	7	VIOLET	10000,000			700	
	100,000,000	8	GRAY	100,000,000		001	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

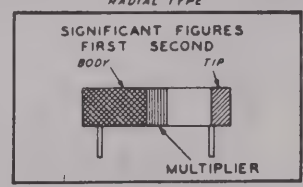
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

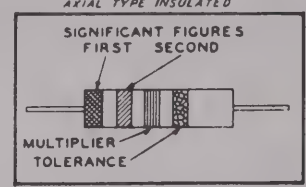


RADIAL TYPE



JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED

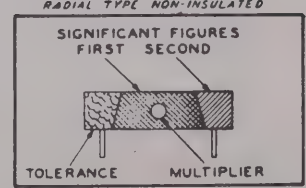


TABLE 8-5. LIST OF MANUFACTURERS

PREFIX	NAME	ADDRESS
CADV	Stoddart Aircraft Radio Co., Inc.	6644 Santa Monica Blvd. Hollywood 38, California
CAFQ	Radio Receptor, Inc.	251 W. 19th Street New York, New York
CAHW	Croname, Inc.	3701 Ravenswood Avenue Chicago, Illinois
CAIS	The Birtcher Corporation	5087 Huntington Drive Los Angeles 32, California
CAMD	Good-All Electric Mfg. Co.	Ogallala, Nebraska
CANS	Kings Electronics, Inc.	372 Classon Avenue Brooklyn 5, New York
CAOR	Radio Frequency Labs.	Boonton, New Jersey
CARD	Johnson-Claplin Corp.	301 Lincoln Street Marlboro, Massachusetts
CARO	Industrial Products Co.	Brookfield Street Danbury, Connecticut
CATD	Fansteel Metallurgical Corp.	Chicago, Illinois
CAUP	Kurz-Kasch, Inc.	1421 South Broadway Dayton, Ohio
CAUZ	Jeffers Electronics Company	Du Bois, Pennsylvania
CAYS	Drake Mfg. Co.	1713 W. Hubbard Street Chicago, Illinois
CAYT	Allen Mfg. Co.	100 Sheldon Street Hartford, Connecticut
CAYZ	Dial Light Corp.	900 Broadway New York, New York
CBGM	Transformer Engineers	389 S. Arroyo Parkway Pasadena, California
CBIM	Switchcraft Co.	1328-30 N. Halsted Street Chicago, Illinois
CBIT	Mueller Electric Co.	1597 East 31st Street Cleveland, Ohio
CBN	Central Radio Laboratory Division of Globe Union	900 E. Keefe Avenue Milwaukee, Wisconsin
CBZ	Allen-Bradley Co.	118 W. Greenfield Avenue Milwaukee, Wisconsin
CCO	Carborundum Co. Globar Division	C. P. Knupper Building Niagara Falls, New York
CD	Cornell-Dubilier Co.	1000 Hamilton Blvd. South Plainfield, New Jersey
CEB	Hugh H. Eby	4700 Stenton Avenue Philadelphia, Pennsylvania
CED	Cannon Electric Development Co.	3291 Humboldt Street Los Angeles 31, California

TABLE 8-5. LIST OF MANUFACTURERS (Cont'd)

PREFIX	NAME	ADDRESS
CER	Erie Resistor Corp.	644 W. 12th Street Erie, Pennsylvania
CG	General Electric Co.	1 River Road Schenectady 5, New York
CHC	Hammarlund Mfg. Co.	460 W. 34th Street New York, New York
CHH	Arrow-Hart & Hegeman Elect. Co.	102 Hawthorne Street Hartford, Connecticut
CJN	North Electric & Mfg. Co.	South Market Street Galian, Ohio
CLF	Littelfuse, Inc.	1865 Miner Street Des Plaines, Illinois
CMA	P. R. Mallory Co., Inc.	1941 Thomas Street Indianapolis, Indiana
CMC	Clarostat Mfg. Co.	Dover, New Hampshire
CMG	Cinch Mfg. Co.	2339 W. Van Buren Street Chicago, Illinois
CPH	American Phenolic Corp.	1830 South 54th Avenue Chicago, Illinois
CR	Wireless Specialty Apparatus Co.	Jamaica Plain Boston, Massachusetts
CRL	Remler Co., Ltd.	2101 Bryant Street San Francisco, California
CSE	Signal Electric Co.	1939 Troam Street Menominee, Michigan
CSF	Sprague Electric	North Adams, Massachusetts
CTE	Telephonics Corp.	Park Avenue Huntington, Long Island
CV	Weston Electrical Instrument Corp.	619 Frelinghuysen Avenue Newark, New Jersey
CW	Western Electric Company	120 Broadway New York 5, New York
——	Vitramon, Inc.	Box 544 Bridgeport, Connecticut
Westcap	San Fernando Electric Mfg. Co.	12900 Foothill Blvd. San Fernando, California
——	Winchester Electronics, Inc.	Glenbrook, Connecticut
——	Dale Products Co., Inc.	Box 1, Columbus, Nebraska
DMC	Chicago Die Mold	4001 Wrightwood Avenue Chicago 39, Illinois
——	Precision Crystal Laboratory	2221 Warwick Avenue Santa Monica, California
——	Pioneer Electronics Corp.	24 Saunders Street Salem, Massachusetts

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